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Retail Price Differences across U.S. and Canadian Cities During the Interwar Period*

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Abstract

We construct a unique panel of retail food prices in 69 Canadian and 51 U.S. cities during the Interwar (1920-40) period. Surprisingly, we find that average relative price dispersion across cities within Canada and the U.S., and the role of distance in accounting for cross-city price differences, was very similar to estimates from the 1980s and 1990s. We also find large changes in the importance of the Canada-U.S. border during the Interwar period. While increased price differences between Canadian and U.S. cities coincide with the end of the gold-standard (and the move to floating nominal exchange rates), large relative and absolute price differences persist even after the Canada-U.S. nominal exchange rate returned to parity. The substantial "thickening" of the border in the 1930s appears to reflect dramatic changes in trade policy and the degree of market integration during this period.

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1 Introduction

There is a large and growing literature that examines how the relative prices of similar goods vary across locations. While most of this literature has focused on recent data

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from the 1970s and later, relatively little is known about whether price differences across countries have changed over longer time horizons. Have the large improvements in transportation technology (i.e. the construction of interstates, containerization) led to smaller cross-city deviations from the law of one price over the last century? Or have changes in trade barriers and increased regulation led to larger cross-country variations?

To address these questions, this paper assembles a unique data set of retail food prices between 69 Canadian and 51 U.S. cities during the Interwar period.[1] The data consists of average retail prices (across multiple establishments) by narrowly defined retail good in each city. Most of the prices are for specific food items, although the Canadian data also has a number of non-food items. The Canadian data we use is reported monthly, and spans October 1922 to October 1940. For the U.S., monthly data is available from July 1920 - July 1930, while annual averages are available from 1930 to 1936.

We use this data to explore the extent of North American retail market integration during the 1920s and 1930s. This period is of particular interest, as the onset of the Great Depression coincided with the end of the gold standard and increased government intervention in domestic and international markets. Thus, while the Canada-U.S. nominal exchange rate was essentially constant during the 1920s (due to the gold standard), the Canadian dollar depreciated over September 1931 to November 1933 as Canada moved to a floating exchange rate regime. In addition, trade barriers between Canada and the U.S. also rose significantly during the 1930s.[2]

Our analysis focuses on deviations from the law of one price across locations both within and between each country. The main object we study is the percentage difference in prices between locations i and j; $q_{ij,t} = \ln p_{i,t} - \ln p_{j,t} - \ln e_t$, where $p_{i,t}$ is the nominal price of the good in city i, and e_t is the cost of a unit of currency used in location j in terms of the currency used in location i (equaling one in the case of same-country city pairs). Using this measure, we examine how relative prices vary with geographic distance, international borders and changes in economic policy.

What we find is surprising. On average, mean relative price dispersion across cities within Canada and the U.S. during the Interwar period is very similar to estimates for the 1980s and 1990s. We also find that the role of distance in explaining relative price differences across cities in our data is very similar to recent estimates for the U.S. (Parsley and Wei, 1996) and Canada (Ceglowski, 2003). In addition, tests of spacial convergence in prices suggest that the extent of market integration within countries is similar to the post-Bretton Woods period.

Our analysis also highlights the roles played by nominal exchange rate fluctuations

[1]The data was originally collected by the Dominion Bureau of Statistics and the Bureau of Labour Statistics for the cost of living index, and originally published in the *The Monthly Labor Review* and *The Labour Gazette*, as well as official statistical summaries. We converted this data to electronic format. Most of the goods are fairly homogenous retail goods, and the data collection process detailed specific descriptions of most goods.

[2]This reflects changes in trade policies in both countries in 1930 as well as increases in the effective ad valorem tariff rates for goods with specific (volume) duties as a result of price deflation.

and the Canada-U.S. border in accounting for price differences across cities. Comparing the kernel densities of log prices differences (across all goods and city pairs) within and between countries, we find two key results. First, throughout the 1920s, the distributions over both international and intranational price differences are quite stable, with distribution means close to zero.[3] Second, there were large movements in international price differences after 1930, captured by changes in both the distribution means and average price dispersion. This shift is similar to that documented in the post-Bretton Woods period by Mussa (1986), who noted that that a move to floating from fixed exchange rates (as effectively occurred in 1931) leads to higher volatility in nominal and real exchange rates. However, we also find that large shift in relative prices remained even after the Canada-U.S. exchange rate returned to parity, which suggest that trade and other policies have likely also played a role. Interestingly, within-country price differences also rise after 1930, particularly in Canada. This highlights a potential link between exchange rate regime and within-country price dispersion not previously explored in the literature.

We complement this analysis by estimating the "width" of the Canada-U.S. border during various sub-periods. To our knowledge, we are the first study of Interwar border effects using retail price data. We follow widely cited work by Engel and Rogers (1996), who examine the volatility of changes in relative price indices corresponding to 14 broad goods categories in 23 U.S. and Canadian cities between 1978 and 1994. They regress the variance of the relative price pairs on the log of the distance between locations, a dummy variable for whether the two goods are in different countries, and a city dummy. Based on their regression results, crossing the border is equivalent to traveling 101 million miles on average within a country in terms of observed dispersion in relative prices.[4] Parsley and Wei (2001) obtain similarly large border effects using a panel of 27 traded goods prices in 96 cities in the U.S. and Japan (88 quarters from 1976 to 1997 and 96 cites). We find that the border effect is significantly smaller during much of the interwar period compared to these recent data estimates.[5] However, the border widens substantially after 1930, with the point estimate of the border effect increasing by more than 40 times its value for the 1920s, moving it much closer to estimates for more recent periods. Our findings suggest that, although nominal exchange rate volatility may be important in accounting for international price dispersion, other factors affecting the degree of market integration matter much more during this time period in terms of standard measures of the border effect.

[3]Crucini et al. (2005) document the same findings for a sample of European countries, examining the distributions of prices relative to the European average in 1975, 1980, 1985, and 1990. Interestingly, these distributions also reveal an average degree of price dispersion between Canadian and US cities during the 1920s is slightly lower than most country averages examined in Crucini et al. (2005).

[4]This estimate represents the average distance one would need to add between cross-border city pairs in order to generate the same amount of price dispersion predicted if there were no border between them.

[5]Gorodnichenko and Tesar (2009) ague that estimates of the border effect from regressions used in Engel and Rogers (1996) may not be identified since differences in price dispersion within each country can influence the estimated border effect. Nevertheless, our results are suggestive of policy induced changes in the border effect during the 1930s.

There is a large literature on law of one price deviations across and within countries.[6] Our work is closely related to Ceglowski (2003) and Parsley and Wei (1996), who examine average price differences across cites within Canada and within the U.S., respectively, using late 20th century data. We find similar cross-city differences in prices for Canada and the U.S. during to their estimates, as well as similar estimates of within country price convergence across cities.[7] Our work differs from these studies both in its temporal focus, as well as in our examination of the role of the Canada-U.S. border on price differences across cities.

Our focus on average prices is also related to recent work on good level price differences. Broda and Weinstein (2008), Burstein and Jaimovich (2009) and Gopinath et al. (2009) examine barcode data for average price differences between locations in Canada and the U.S.. Broda and Weinstein (2008) find that the border between Canada and the U.S. is very small with respect to differences in barcode-level retail prices. Gopinath et al. (2009) use retail and wholesale prices from identical Canadian and US grocery chains to examine the effects of the border and nominal exchange rate fluctuations on relative price differences and markup behaviour across store locations. In contrast to Broda and Weinstein (2008), they find that the impact of the border on average price dispersion is economically significant, and find that fluctuations in the median retail and wholesale price deviations closely follow the U.S.-Canada nominal exchange rate.

Although there are far fewer studies that have examined LOP deviations in a historical context, there are a number of recent papers that are related to ours. Jacks (2009) investigates time-dependent border and distance effects on relative price volatility using traded wheat price data for over 100 American and European cities in the period from 1800 to 1913. He finds that the importance of these variables declines sharply before the end of nineteenth century, and the impact of distance on price dispersion remains is relatively stable thereafter. This suggests that substantial reductions in trade costs occurred before the turn of the century. He also estimates the border effect for the 1900-1910 period to be about 90% less than that of 1800-1810, with the largest reduction between 1870 and 1880, which he attributes to the mass adoption of the gold standard. Hynes et al. (2009) use a threshold auto-regression approach to estimate commodity- and time-specific bilateral costs between 51 countries from weekly commodity price series. Their estimates suggest trade costs fell gradually during the 1920s and rose sharply during the Great Depression. Increasing transport costs (as a proportion of the value of the trade commodities) explains some of the war-time increase, which is consistent with Mohammed Shah and Williamson's (2004) examination of real freight rate indices.

Hickey and Jacks (2011) also work with Canadian historical price data published in the *Labour Gazette*. They examine price data covering a longer time horizon (1910-1950), while focussing on a smaller subset goods and cities (10 goods and 50 Canadian

[6]e.g. see Betts and Devereux (1996); Engel and Rogers (1996); Berka (2009).

[7]Rogers and Jenkins (1995) look at disaggregated monthly CPI data for 54 goods and services in Canada and the spanning 1973-1990. In contrast to Ceglowski's findings for long-run PPP within Canada, they are unable to reject the null hypothesis of a unit root for 44 of the 54 good categories.

cities).[8] They find that average price dispersion within Canada is generally declining over the period under consideration, except for an increase during the first half of the 1930s. They also find evidence a rise in distance-related costs during the WWI period and throughout the 1930s, which is consistent with our findings.

The rest of the paper is organized as follows. Section 2 briefly summarizes the data, relevant trade and exchange rate policies, as well as the structure of retail and wholesale food trade in Canada and the U.S. during the Interwar period. In Section 3, we examine the impact of geographical distance on price dispersion and price convergence within each country, drawing comparisons with studies of more recent periods. In Section 4 we analyze international price differences, using available annual average data to explore the impact of changes in exchange rate regime and trade policy. Section 5 concludes.

2 Background on Data and Economic Structure

We briefly provide some background information on the data and nominal and real exchange rates in Canada and the United States during the Interwar period. As we argue below, the Interwar period is interesting to study since it features periods of both fixed and floating exchange rates as well as large changes in trade policies.

2.1. Monthly Retail Price Data

The data consists of average retail prices by city during the Interwar period that were collected in Canada and the United States for use in the construction of price indexes. Most of the prices are for food items, although the Canadian data also has a number of non-food items.

The U.S. retail prices of food were collected by the Bureau of Labour Statistics (BLS) and reported in the *Monthly Labour Review*, *Retail Prices*. These prices are averages of actual selling prices of retailers on the 15th of each month. By 1920 (when our data begins), retail prices of food were collected from 51 U.S. cities. Agents of the Bureau of Labor Statistics selected stores which catered to wage earners. These stores included local neighborhood stores, department stores and chain stores. However, upscale retail outlets were not sampled (*Retail Prices, 1890-1928*, page 11). For larger cities, 25 to 30 stores were sampled each month while in smaller cities 10 to 15 stores were sampled. If a store exited the survey, it was replaced with a similar establishment. Efforts were made to ensure that prices were for similar items. In cases where there were systematic regional variations in product quality (such as the type of meat cut), details of the variation were reported. The monthly data is available from July 1920 - July 1930. We have also obtained annual average prices from 1926 to 1936 published by the BLS for the same sample of U.S. cities.

[8]Their sample includes sirloin steaks, butter (creamery), corn (canned), milk, peas (canned), potatoes, prunes, sugar, tea and tomatoes (canned).

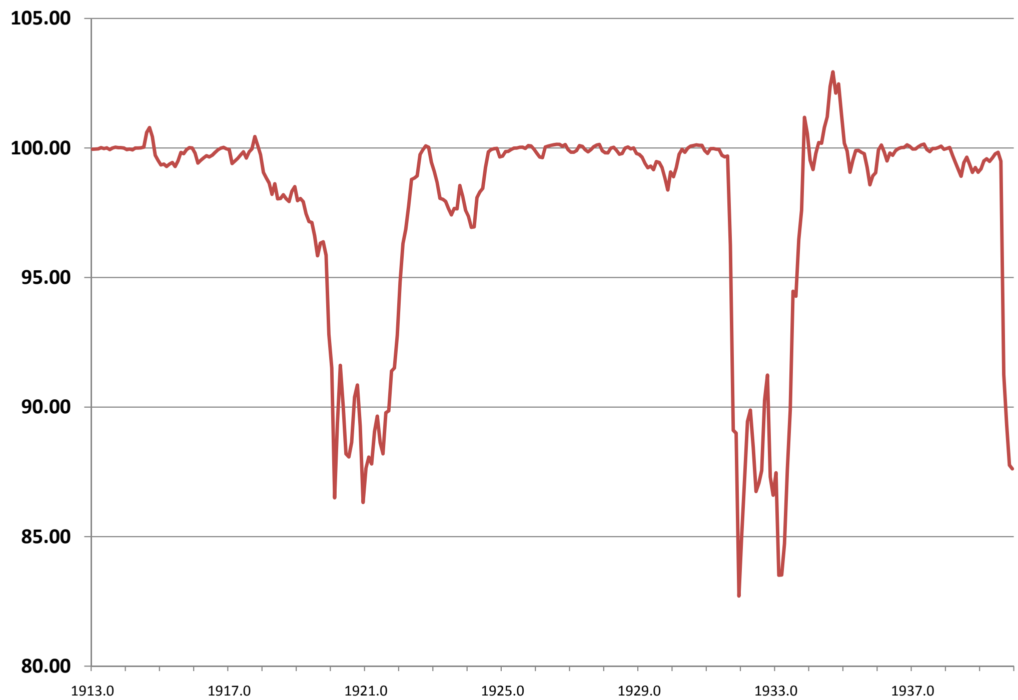
The Canadian data were published monthly in the *Labour Gazette*. Average retail prices for seventy one items (58 food items 14 non-food items) including staple foods, groceries, coal, wood, coal oil and housing rent were collected for 69 cites in Canada. The prices of food and groceries were based on average of quotations reported to the Dominion Bureau of Statistics by representative groceries and butchers in each city on the 1st of each month. The quotes for milk, bread, fuel and rent were secured by correspondents of the Labour Gazette and the Bureau of Statistics. Our data set runs from October 1922 to October 1940. We restrict our attention to 43 food items. Complete lists of the cities and the items for which we have data are found in the Appendix.

2.2. Nominal Canada-U.S. Exchange Rate during the Interwar Period

Prior to World War I, Canada and the United States were both on the gold standard, with a par value of one Canadian dollar for one U.S. dollar. In 1914 (shortly after entering World War I), Canada suspended convertibility of the dollar into gold and did not (formally) return to the gold standard until July 1926. When it did return, dominion notes (Canadian dollar) and U.S. dollars were both convertible into gold at the rate of $20.67 per ounce. Although the United States also suspended convertibility during the First World War, it returned to the gold standard in June 1919.

Figure 1 illustrates the evolution of Canada-U.S. nominal exchange rate, expressed as Canadian dollars per U.S. dollar, over the 1913-1940 period. The Canadian dollar depreciated by more than 10 percent on two occasions - once after WWI and in 1931. The depreciation of 1931 came roughly two years after Canada de facto left the Gold Standard, as gold shipments were suspended in January 1929 (Bordo and Redish, 1990). Despite the suspension of convertibility, the Canadian government took steps to prevent depreciation of the dollar, motivated in part by a wish to maintain access to American capital markets to refinance Dominion debt (Shearer and Clark, 1984). As a result, the government maintained the advance rate at its 1928 level throughout 1930, despite the fall in world rates. This policy was ultimately abandoned after the British left the Gold Standard in October, 1931. Subsequently the Canadian dollar depreciated relative to the U.S. dollar by approximately 15 percent, before beginning to appreciate after the U.S. left the Gold Standard in March of 1933. In April of 1933, Canada “officially” moved to confirm their policy of non-redemption of notes for gold. The Canadian currency reaches parity again in November 1933, although the exchange rate still fluctuates somewhat until 1935, and remained near parity until October 1939, when the Canadian dollar again depreciated relative to the U.S. Shortly after entering World War II, Canada once again imposed exchange rate controls.

Figure 1: Canada-U.S. Nominal Exchange rate



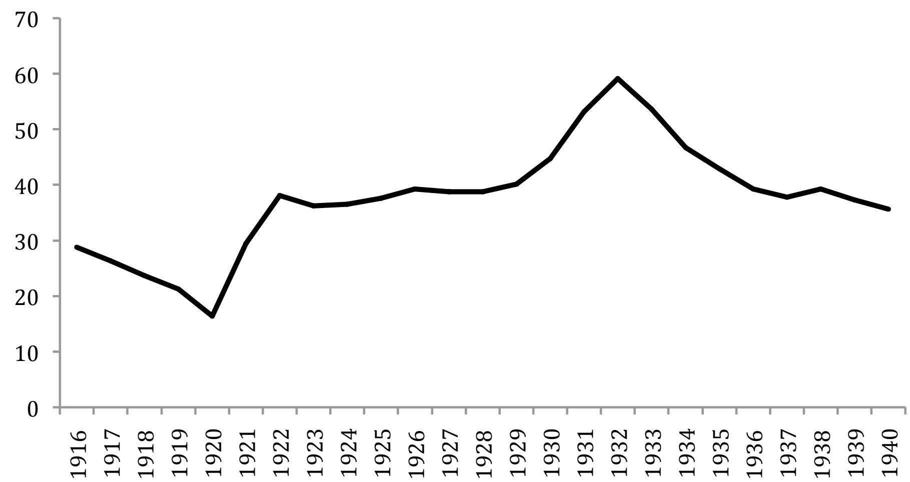
2.3. Tariff and Non-Tariff Barriers

Significant changes to trade policy in Canada and the U.S. also occurred at roughly the same time as the change in the exchange rate regime. Figure 2 illustrates changes in the average duty on all dutiable U.S. imports over the sample period. The sharp increase after mid-1930 corresponds with the signing of the Hawley-Smoot Tariff act on June 17, 1930, that raised U.S. tariffs on over 20,000 imported goods to record levels. The primary Canadian exports affected were wheat, flaxseed, millwood, cattle, milk products, wool, and pollock, cod & haddock.[9] The ensuing retaliatory tariffs by U.S. trading partners, Canada in particular, would have also impacted on U.S. exports. (In fact, Canada responded in the preceding months in anticipation of the act, preemptively imposing tariffs on 16 products that accounted altogether for around 30% of U.S. exports to Canada. Before this, Canada had maintained a relatively stable tariff level.) The main U.S. exports to Canada affected by Canadian duties were potatoes, eggs, fresh meats, butter, wheat, flour, and rolled oats.

By 1935 both governments sought to reduce trade barriers by lifting tariffs on several products and increasing staple exports through a series of trade agreements (notably with the United States-Canada Trade Agreement, which affected predominantly fish, cattle, lumber, cheese, cream, whiskey and potatoes). Figure 2 shows the substantial reduc-

[9]See McDonald et al. (1997).

Figure 2: U.S. Import Duties (Share of Dutiable Imports)



tion in average U.S. tariffs by 1935, although non-tariff barriers were also important in explaining reduced trade between Canada and the U.S. during this period. Because we were unable to obtain data on the value of dutiable imports in Canada, we could not calculate the corresponding indicator for average Canadian tariffs. Figure 3 instead compares duties in both countries as a share of total imports. As a share of total imports, the rise in U.S. import duties dies out more gradually. The rise in duties in Canada during 1930-1934 is also apparent, but much less pronounced than in the U.S..

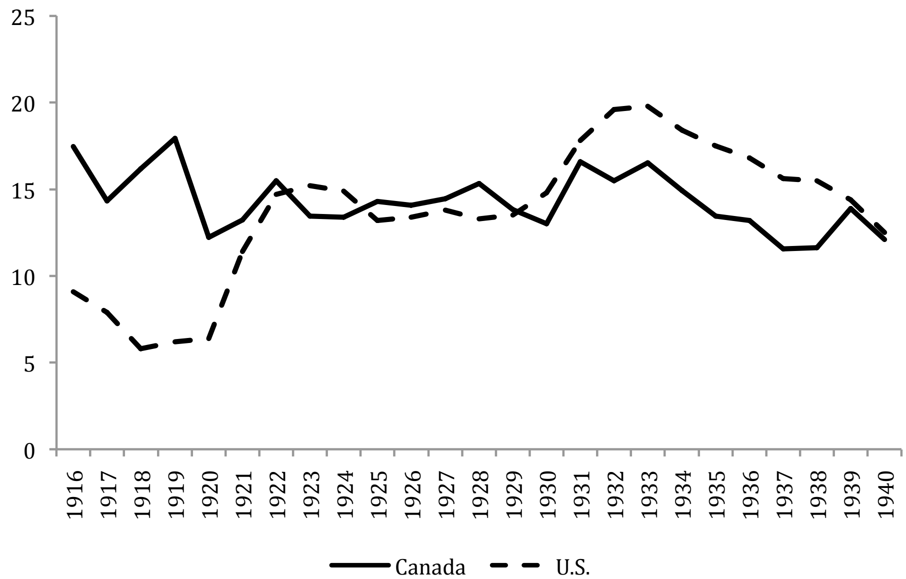
2.4. Retail and Wholesale Trade in the United States and Canada

Given the focus on comparing retail price variation between North American cities, a potentially important issue is whether there were significant differences in the structure of retail markets between Canada and the U.S. during the Interwar period. Overall, the available evidence suggests that the retail and wholesale sectors were similar in both countries, and both countries also experienced similar trends during the interwar period.

At the retail level, gross retail operating expenses (as a share of sales) were very similar in both countries, averaging 27.3% in the U.S. in 1929 and 30.6% in Canada in 1930 (Whiteley, 1936). The structure of the retail sector in Canada and United States (in 1929 and 1930) – in terms of employment shares, store size, and sales across store categories – was also very similar (Whiteley, 1936).

The interwar period witnessed significant changes in food distribution in both Canada and the U.S. The interwar period saw the spread of self-service retail stores (supplanting the model where clerks took customers orders and bundled them), as well as the growth of large chain stores that specialized in the distribution of food items across multiple cities. This trend appears to have been very similar in both countries, with Canadian firms such

Figure 3: Import Duties (Share of Total Imports)



as Loblaws (centered in Toronto) moving to quickly adopt retail innovations pioneered by American firms such as A&P (see Boothman, 2008; Lerner and Patil, 2008).

Lazo and Bletz (1938) examine the retail cost structure of various types of food items in the U.S. in 1937 for various stages of production. Their results are summarized in Table 1. These data highlight two key forces. First, the average retail and wholesale share of food items was significant for food: nearly 40%. Second, the cost of processors, assemblers and packers was also very large: in some cases exceeding that of the food producers.

There is also some data for the early 1920s. The Bureau of Labour Statistics (1925) decomposes the retail price of bread in 7 cities over 1922-23. The retail margin was roughly 15%, while the baker's margin (over the cost of flour) was roughly 55%, and the farmer's margin was also roughly 15%, with the remainder of the cost being attributable to transportation and milling costs. For meat products sold in retail meat markets, the retail margin was roughly 20%, with the remaining 80% attributable to the cost of meats. The Bureau of Labour Statistics (1925) reported much higher retail margins for apples of nearly 40% (representative of fresh fruits and vegetables) in the New York region in 1922-23. Including the cost of jobbing (which is local distribution), the local distribution cost share was 47%, with an additional 29% being attributable to wholesale and transportation costs. As a result, for apples, only 23.4% of the retail price was associated with the producer cost of apples.

The potentially high retail margins for some food items is important to consider because differences in retail costs may be highly variable across locations. This non-traded component of final goods prices may account for a significant proportion of observed

Table 1: Percent of Weekly Food Expenditure Paid to Various Stages: 1937

	Total	Dairy & Eggs	Flour, Bread & Cereal	Meat & Fish	Canned Goods	Fruits & Fresh Veget.	Bev., Seas. & Desserts
Farmers & Prim.	36.5	47.1	23.7	48.3	19.6	29.1	28.6
Transportation	6.5	4.9	8.1	5.1	3.0	20.5	6.8
Brokers & agents	2.3	0.4	3.0	1.5	2.2	1.3	2.0
Proc., assemblers & packers	27.2	27.8	42.2	13.7	50.0	13.9	34.7
Wholesale grocers	5.8	5.8	4.4	5.4	7.5	4.0	7.5
Retail grocers	21.8	13.9	18.5	26.0	17.7	31.1	20.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Lazo and Bletz (1938). The figures are for an average family of four persons with an average income of $2,100. (Dominion Bureau of Statistics, 1930).

price differences across locations.

A final issue is sales tax. For the U.S., retail sales tax were introduced in 13 states in which the BLS collected retail price data in the mid-1930s (Riley, 1937). As a result, sales tax is likely an unimportant factor for the time period we are interested in.

3 Intranational Evidence on Relative Price Dispersion: Canada and the U.S.

We begin by examining price differences between cities within each country. Our intranational analysis yields three key findings. First, mean absolute price differences across Canadian and U.S. cities were very similar during the Interwar period. On average, mean prices varied across Canadian city pairs by roughly 13 percent versus roughly 12 percent for U.S. city pairs. Second, we find a very similar role for distance in both countries compared to evidence for the late twentieth century. Third, the the degree of retail price convergence across cities during the Interwar period is also similar when comparing to recent evidence for Canadian cities. This suggests that the extent of market integration during the Interwar period was very similar to that at the end of the twentieth century.

Our analysis focuses on the percentage difference in prices between locations i and j, $q_{ij,t}$:

$$q_{ij,t} = \ln p_{i,t} - \ln p_{j,t} - \ln e_t. \tag{1}$$

where $p_{i,t}$ is the nominal price of the good in city i, and e_t is the cost of a unit of currency used in location j in terms of the currency used in location i (equaling one in the case of same-country city pairs). In analyzing these price differences, we follow standard theory. If costs of arbitrage (e.g. transportation, tariff barriers) represented by A_{ij}, are proportional to prices, then "weak" LOP holds:

$$-A_{ji} \leq q_{ij,t} \leq A_{ij}$$

implying that price differences are contained within a "band of no arbitrage". For example, if t_{ij} is the marginal tariff rate and NTB costs, and τ_{ij} represents iceberg transport costs, then

$$\frac{p_{i,t}}{e_t p_{j,t}} \leq \frac{1+t_{ij}}{1-\tau_{ij}}$$

and $A_{ij} = \ln(1+t_{ij}) - \ln(1-\tau_{ij})$. Furthermore, if these costs are symmetric ($A_{ij} = A_{ji}$), then $|q_{ij,t}| \leq A_{ij}$. Even if this relationship holds in the long run, fluctuations in domestic market conditions may result in short run deviations that do not reflect arbitrage costs, particularly if nominal prices are sticky.

Two aspects of deviations from PPP are considered: the long-run tendency towards PPP and the importance of distance related costs in explaining differences in prices across locations. The long-run tendency towards the Law of One Price is examined by testing for the existence of a unit root on the individual price series for each city, relative to a benchmark city. This is carried out using the Augmented Dickey Fuller (ADF) test; for each city j (except the benchmark city) and each item k we regress

$$\Delta q_{j,t}^k = \alpha_j^k + \beta_j^k q_{j,t-1}^k + \sum_{m=1}^{n} \gamma_{j,m}^k \Delta q_{j,t-m}^k + e_{j,t}^k. \tag{2}$$

(The i subscript corresponding to the benchmark city is omitted for clarity.) The unit-root hypothesis is rejected if $\beta_j^k < 0$. The lag length n is chosen for each item and city by first estimating the equation using a total of 6 lagged values and reducing this number until the coefficient on the highest lagged value is significant at conventional levels. We summarize the results by comparing the proportion of cities for which the null hypothesis of a unit root is rejected across goods.

It is important to note that even where LOP holds, the ADF test has a tendency to under-reject the unit-root hypothesis. Specifically, weak LOP implies $\Delta q_{ij,t}^k < 0$ when $q_{ij,t-1}^k > A_{ij}$, but $q_{ij,t}^k$ may follow a random walk within the no-arbitrage band. Even if there is strong convergence when relative prices move outside this band, standard stationarity tests may fail to reject a unit-root if much of the variation in relative prices occurs within the band. Recent applications of the threshold autoregression (TAR) estimation method have proved effective in dealing with this sort of non-linear dynamics. (See, for example, Coleman, 1995; Obstfeld and Taylor, 1997; Sarno et al., 2004; Berka, 2009). For the purpose of comparability with estimated price convergence for more recent periods, however, we stick to this standard stationarity test.

3.1. Mean Average Price Differences and Distance between Cities

We begin our analysis by examining intranational relative price dispersion and the role of distance-related trade costs. Following Engel and Rogers (1996) we examine mean absolute price differential (MAPD), $\tilde{q}_{ij}^k = T^{-1} \sum_{t=0}^{T} |q_{ij,t}^k|$, as a measure of average price dispersion between locations i & j and commodity k over T periods. We first examine price differentials over our monthly data samples, October 1922- October 1940 period for Canadian cities and July 1920- July 1930 period for U.S. cities. The summary statistics for the MAPD across all city pairs are reported in Table 2 for Canadian cities and in Table 3 for U.S. cities. The average MAPD across goods are similar for most goods, with most goods near the overall average of roughly 13%. Dividing goods into perishable and non-perishable, one finds that the MAPD for non-perishable goods is on average 20% lower than that for perishable goods in both countries. This pattern holds for both the full sample of goods and a restricted sub-sample of common goods.

To examine the role of distance (a proxy for trade costs), we estimate the impact of distance-related costs on absolute price deviations for each good. We follow Parsley and Wei (1996) and Ceglowski (2003) and regress MAPD on the geographic distance between cities:

$$\tilde{q}_{ij}^k = \beta_1^k + \beta_2^k \ln\left(dist_{ij}\right) + \sum_{s=1}^{I+J-1} \delta_s^k d_s + u_{ij}^k$$

$$\tilde{q}_{ij}^k = \beta_1^k + \beta_2^k \ln\left(dist_{ij}\right) + \beta_3^k \ln\left(dist_{ij}\right)^2 + \sum_{s=1}^{I+J-1} \delta_s^k d_s + u_{ij}^k \tag{3}$$

The measure of geographical distance, $dist_{ij}$, used is the 'great circle distance' between cities.[10] The d_s term is a dummy variable for each city (except one). Estimation is carried out using heteroscedasticity-consistent standard errors.

Table 4 summarizes the results from regressing MAPD on the log of distance and distance squared for the Canadian city sample and Table 5 presents the results for U.S. cities. For both samples and for all goods, the coefficients in the linear specification are all significant. The results also line up with expectation that trade costs are positively related to distance, as we find that distance increases mean price differences between cities. The pooled-sample coefficients for perishable and non-perishable goods are quite similar for Canada, but for the U.S. the coefficient for perishable goods is twice that for non-perishable goods. Averaging across all goods, however, the estimated relationship is very similar for Canada and the U.S.. Doubling the distance between cities increases mean absolute price differences by roughly 2 percentage points, on average.

Estimated quadratic relationships vary considerably across goods as well as differ

[10]Great circle distance is a preferable measure for historical analysis since, unlike highways connecting cities, this measure is constant over long periods of time. For robustness, the shortest highway distance measured using Google Maps was also used in these regressions with no substantive impact on the results presented

Table 2: Mean Absolute Price Differential across Canadian Cities

Product	Mean	St. Dev.	Min	Max
Perishables				
Sirloin steak	0.140	0.081	0.036	0.523
Round steak	0.129	0.064	0.037	0.325
Rib roast	0.150	0.068	0.035	0.490
Shoulder roast	0.146	0.067	0.040	0.414
Stewing beef	0.197	0.096	0.046	0.614
Veal shoulder	0.229	0.121	0.038	0.775
Mutton leg	0.170	0.064	0.065	0.455
Pork Leg	0.129	0.067	0.030	0.463
Salt mess pork	0.122	0.045	0.036	0.377
Bacon, not sliced	0.116	0.063	0.031	0.330
Bacon, sliced	0.118	0.067	0.028	0.346
Ham, sliced	0.062	0.022	0.021	0.165
Eggs, fresh	0.147	0.062	0.034	0.361
Eggs, cooking	0.149	0.063	0.048	0.395
Milk, fresh	0.152	0.095	0.003	0.660
Butter, solid	0.102	0.046	0.030	0.305
Butter, creamery	0.069	0.036	0.015	0.195
Cheese	0.097	0.046	0.036	0.315
Onions	0.195	0.062	0.071	0.491
Potatoes, 100lb bag	0.277	0.105	0.056	0.768
Potatoes, 15lb bag	0.255	0.099	0.054	0.732
Prunes	0.097	0.027	0.046	0.253
Raisins	0.080	0.030	0.024	0.213
Currants	0.096	0.041	0.031	0.287
Perishables	0.145	0.088	0.003	0.775
Non-perishables				
Lard	0.089	0.036	0.024	0.240
Soda biscuits	0.115	0.058	0.032	0.373
Flour	0.139	0.085	0.021	0.449
Rolled oats	0.101	0.039	0.032	0.279
Rice	0.143	0.073	0.033	0.448
Tapioca	0.161	0.107	0.029	0.636
Beans, dry	0.124	0.045	0.049	0.341
Salmon, canned	0.240	0.124	0.054	0.694
Tomatoes, canned	0.109	0.056	0.021	0.323
Peas, canned	0.104	0.049	0.027	0.320
Corn, canned	0.109	0.060	0.020	0.319
Peaches, canned	0.097	0.035	0.039	0.264
Jam	0.123	0.042	0.029	0.339
Marmalade	0.112	0.037	0.037	0.271
Corn syrup	0.113	0.057	0.024	0.287
Sugar, granulated	0.075	0.038	0.019	0.236
Sugar, yellow	0.077	0.038	0.020	0.222
Coffee	0.108	0.047	0.033	0.322
Tea	0.084	0.034	0.027	0.231
Non-Perishables	0.117	0.071	0.019	0.694
All Goods	0.133	0.082	0.003	0.775

across countries. For Canada, the estimated relationship between distance and average price differences is concave for beef products and pork, as well as most dairy products (except Milk). For the U.S., by contrast, the estimated relationship is convex most beef

Table 3: Mean Absolute Price Differential across U.S. Cities

Product	Mean	St. Dev.	Min	Max
		Perishables		
Sirloin steak	0.219	0.173	0.024	0.837
Round steak	0.181	0.129	0.022	0.637
Rib roast	0.148	0.098	0.022	0.473
Shoulder roast	0.135	0.080	0.022	0.456
Stewing Beef	0.152	0.091	0.027	0.538
Pork chops	0.098	0.050	0.028	0.314
Bacon, sliced	0.112	0.069	0.023	0.391
Ham, sliced	0.104	0.071	0.021	0.428
Mutton leg	0.094	0.049	0.020	0.306
Hens	0.133	0.078	0.019	0.377
Milk, fresh	0.179	0.118	0.005	0.630
Butter	0.060	0.031	0.015	0.194
Margarine	0.073	0.032	0.018	0.233
Cheese	0.069	0.039	0.019	0.274
Eggs, fresh	0.182	0.116	0.024	0.536
Bread	0.090	0.044	0.020	0.272
Potatoes	0.238	0.121	0.049	0.723
Onions	0.168	0.089	0.048	0.610
Cabbage	0.223	0.070	0.068	0.430
Prunes	0.103	0.065	0.032	0.487
Raisins	0.074	0.035	0.025	0.204
Oranges	0.137	0.066	0.047	0.428
Perishables	0.135	0.100	0.005	0.837
		Non-Perishables		
Salmon, canned	0.094	0.043	0.021	0.244
Milk, evaporated	0.073	0.045	0.013	0.266
Lard	0.089	0.060	0.015	0.400
Veg. lard substitute	0.107	0.075	0.015	0.438
Flour	0.114	0.081	0.019	0.507
Corn meal	0.230	0.150	0.036	0.758
Rolled oats	0.100	0.055	0.022	0.330
Corn flakes	0.066	0.035	0.015	0.216
Wheak cereal	0.046	0.026	0.009	0.170
Macaroni	0.137	0.137	0.016	0.886
Rice	0.107	0.072	0.024	0.459
Beans, navy	0.093	0.043	0.025	0.270
Beans, baked	0.125	0.076	0.019	0.422
Corn, canned	0.096	0.053	0.025	0.286
Peas, canned	0.114	0.067	0.024	0.351
Sugar, granulated	0.071	0.043	0.016	0.284
Tea	0.174	0.113	0.023	0.548
Coffee	0.094	0.063	0.016	0.405
Non-perishables	0.109	0.087	0.009	0.886
All Goods	0.123	0.095	0.005	0.886

and pork products, and for dairy products the relationship varies. The pooled sample estimates for both countries suggest the relationship between distance and average price differences is, on average, convex. However, estimating the quadratic relationship yields little gain in explanatory power over the linear model.

Table 4: Effect of Distance on Price Dispersion in Canada

Product	log distance	R^2	log distance	distance^2	R^2	Obs.
			Perishables			
Sirloin steak	0.701**	0.67	4.224**	-0.293**	0.68	2345
Round steak	0.883**	0.57	2.776**	-0.163*	0.57	2345
Rib roast	0.774**	0.58	1.180	-0.038	0.58	2345
Shoulder roast	1.427**	0.58	2.543*	-0.093	0.58	2345
Stewing beef	1.732**	0.46	13.69**	-1.012**	0.48	2345
Mutton leg	2.133**	0.59	-5.592**	0.657**	0.61	2345
Pork leg	1.103**	0.64	5.522**	-0.373**	0.65	2345
Salt mess pork	0.621**	0.53	1.787**	-0.094+	0.53	2345
Bacon, not sliced	3.163**	0.70	-11.21**	1.228**	0.77	2345
Bacon, sliced	3.567**	0.68	-12.91**	1.406**	0.76	2345
Ham, sliced	0.493**	0.66	0.216	0.023	0.66	2345
Salt cod	5.089**	0.57	-18.11**	1.976**	0.65	2345
Finnan haddie	2.096**	0.59	-7.892**	0.849**	0.63	2345
Milk	0.844**	0.64	4.126**	-0.273**	0.65	2345
Butter, solids	0.939**	0.53	1.312+	-0.037	0.53	2345
Butter, creamery	1.060**	0.50	3.655**	-0.223**	0.51	2345
Cheese	1.578**	0.60	-5.022**	0.561**	0.63	2345
Eggs, fresh	1.280**	0.38	3.507**	-0.183**	0.38	2345
Eggs, cooking	1.594**	0.48	-0.042	0.139*	0.48	2345
Onions	2.837**	0.65	4.816**	-0.163*	0.65	2345
Potatoes, per 15lb	5.592**	0.78	-3.512**	0.774**	0.79	2345
Potatoes, per 100lb	4.817**	0.74	-2.142*	0.591**	0.74	2345
Prunes	0.499**	0.66	-0.883+	0.117**	0.67	2345
Raisins	0.758**	0.57	1.411**	-0.059	0.57	2345
Currants	0.870**	0.56	4.444**	-0.303**	0.57	2345
Perishables	1.858**	0.51	-0.493*	0.199**	0.51	58625
			Non-Perishables			
Salmon, canned	3.276**	0.43	12.79**	-0.803*	0.44	2345
Lard	0.965**	0.53	2.429**	-0.123+	0.54	2345
Flour	3.702**	0.47	18.42**	-1.252**	0.52	2345
Rolled oats	1.044**	0.64	1.707**	-0.052	0.64	2345
Tapioca	3.595**	0.76	-9.992**	1.156**	0.78	2345
Soda biscuits	1.667**	0.74	-1.722*	0.288**	0.75	2345
Rice	1.931**	0.53	8.916**	-0.593**	0.55	2345
Beans, dry	1.604**	0.73	-3.612**	0.443**	0.75	2345
Tomatoes, canned	3.085**	0.57	-2.592**	0.482**	0.59	2345
Corn, canned	3.266**	0.62	-6.882**	0.863**	0.66	2345
Peas, canned	2.631**	0.59	-2.922**	0.472**	0.61	2345
Peaches, canned	1.249**	0.59	0.970	0.023	0.59	2345
Jam	1.093**	0.61	-0.18	0.108*	0.61	2345
Marmalade	0.995**	0.58	0.294	0.059	0.58	2345
Corn syrup	3.468**	0.59	0.250	0.273**	0.60	2345
Sugar, granulated	1.160**	0.48	1.007*	0.013	0.48	2345
Sugar, yellow	1.200**	0.48	0.252	0.080+	0.48	2345
Coffee	1.602**	0.52	-5.602**	0.612**	0.55	2345
Tea	1.471**	0.58	0.160	0.111*	0.59	2345
Non-perishables	2.053**	0.38	0.718**	0.113**	0.38	44555
All goods	1.942**	0.47	0.031	0.162**	0.47	103180

Coefficients have been scaled by 100 for clarity in presentation. Significance levels : + : 10% * : 5% ** : 1%

3.2. Price Convergence

We test the relative prices series for each city in Canada and the US relative to a benchmark (Toronto and Chicago) for stationarity. The results from the ADF tests for common

Table 5: Effect of Distance on Price Dispersion in the U.S.

Product	log distance	R^2	log distance	distance^2	R^2	Obs.
			Perishables			
Sirloin steak	7.534**	0.46	-0.965	0.702	0.46	1275
Round steak	6.641**	0.45	-4.068	0.884**	0.46	1275
Rib roast	3.754**	0.36	2.084	0.137	0.36	1275
Shoulder roast	3.170**	0.40	-8.0092**	0.923**	0.41	1275
Stewing beef	1.263**	0.29	1.721	-0.039	0.29	1275
Pork leg	2.106**	0.36	2.567	-0.036	0.36	1275
Bacon, sliced	2.978**	0.46	-19.781**	1.880**	0.53	1275
Ham, sliced	0.719**	0.40	-6.152*	0.567**	0.41	1275
Mutton leg	1.394**	0.38	-3.482+	0.402**	0.39	1275
Hens	4.319**	0.29	3.722	0.049	0.29	1275
Milk, fresh	3.179**	0.40	7.865**	-0.387	0.40	1275
Butter	1.447**	0.45	-1.386	0.234*	0.46	1275
Margarine	0.760**	0.50	-0.547	0.108	0.50	1275
Cheese	0.777**	0.40	1.121	-0.026	0.40	1275
Eggs, fresh	5.562**	0.40	12.77**	-0.595	0.40	1275
Bread	0.640**	0.38	2.388*	-0.143+	0.38	1275
Potatoes	4.482**	0.40	0.637	0.317	0.40	1275
Onions	2.771**	0.59	-17.781**	1.698**	0.63	1275
Cabbage	3.082**	0.46	-2.702	0.480*	0.46	1225
Prunes	1.543**	0.49	-3.4402*	0.411**	0.49	1275
Raisins	1.195**	0.42	-0.961	0.178*	0.42	1275
Oranges	2.236**	0.42	-0.307	0.210	0.42	1275
Perishables	2.798**	0.34	-1.5642**	0.360**	0.34	28000
			Non-Perishables			
Salmon, canned	0.889**	0.32	-3.112+	0.330*	0.33	1275
Milk, evaporated	1.039**	0.37	-5.682**	0.555**	0.39	1275
Lard	1.817**	0.54	-7.362**	0.758**	0.55	1275
Veg. lard substitute	2.027**	0.41	-0.389	0.199	0.41	1275
Flour	1.729**	0.41	0.638	0.090	0.41	1275
Corn meal	2.439**	0.30	9.993+	-0.623	0.30	1275
Rolled oats	0.387*	0.31	-1.558	0.160	0.32	1275
Corn flakes	0.982**	0.33	-3.532**	0.372**	0.34	1275
Wheak cereal	0.541**	0.42	-1.043	0.130*	0.42	1275
Macaroni	1.372**	0.45	-7.522+	0.735*	0.45	1275
Rice	0.422*	0.39	5.130**	-0.383**	0.39	1275
Beans, navy	0.721**	0.38	4.969**	-0.353**	0.38	1275
Beans, baked	2.478**	0.36	-7.232**	0.802**	0.37	1275
Corn, canned	1.007**	0.33	1.523	-0.048	0.33	1275
Peas, canned	1.062**	0.27	5.285**	-0.343*	0.28	1275
Sugar, granulated	1.304**	0.45	0.264	0.085	0.45	1275
Tea	2.230**	0.24	12.35**	-0.833*	0.25	1275
Coffee	0.999**	0.32	-0.670	0.137	0.32	1275
Non-perishables	1.397**	0.26	-0.266	0.137**	0.26	24225
All Goods	2.148**	0.31	-0.953*	0.256**	0.31	52225

Coefficients have been scaled by 100 for clarity in presentation. Significance levels : + : 10% $*$: 5% $**$: 1%

goods in Canada and the U.S. are summarized in Table 6. (Milk, Onions and Canned Peas, are also common goods categories in both data sets, but ADF tests are not reported as there were few or no cities for which uninterrupted monthly price series were available.) We report the percentages of cities in the sample for which a non-stationary relative price series can be rejected – the proportion of cities for which the price relative to that of the benchmark city converges to some constant – at the 5% and 10% significance levels. The first column reports the total number of relative price series. This number varies across goods according to the number of cities for which goods prices are available without breaks over the entire sample period.

Table 6: Augmented Dicky Fuller Tests: Canada and the U.S.

	Canada: Oct 1922- Nov 1939			United States: June 1920- July 1930		
Product	N	5%	10%	N	5%	10%
Sirloin steak	49	76	80	50	32	38
Round steak	49	76	86	50	30	42
Rib roast	43	91	91	47	36	38
Shoulder roast	47	68	72	50	8	14
Stewing beef	47	68	72	44	39	55
Mutton leg roast	10	30	40	50	62	80
Bacon, sliced	44	45	61	50	42	58
Ham, sliced	44	86	89	50	52	66
Salmon, canned	28	32	43	50	26	46
Lard	51	80	84	50	28	48
Eggs, fresh	44	98	98	50	94	96
Butter, creamery	50	86	86	50	82	90
Cheese	44	61	64	50	48	64
Flour	52	44	62	50	62	76
Rolled oats	39	79	85	50	82	90
Rice	52	40	46	50	30	42
Corn, canned	32	69	81	50	20	38
Potatoes	34	97	97	50	96	98
Prunes	39	82	87	50	26	54
Raisins	51	51	53	50	12	32
Sugar, granulated	48	81	92	50	42	50
Coffee	47	43	57	50	14	32
Tea	55	33	44	50	4	16

Convergence in Canadian city prices relative to the Toronto benchmark is quite common for most fresh meats, with rejections of a unit root for approximately 70% of the series or more at the 5% significance level (except for Mutton Leg, for which a unit root is only rejected in 30% of cases, and Sliced Bacon for which a unit root is rejected in 45% of cases). Relative prices of Eggs, Butter, Sugar, Rolled Oats, Potatoes, and Canned Corn exhibit a large degree of stationarity among Canadian cities. The unit root is rejected at the 5% level for less than 50% of the series for only one quarter of the goods: Mutton Leg, Bacon, Canned Salmon, Flour, Rice, Coffee and Tea.[11] This suggests a high level of convergence in relative prices across locations, in terms of retail food items, in Canada during the interwar period.

For U.S. cities, there is again substantial evidence across cities of convergence in relative prices, but for some goods we are able to reject the unit root-hypothesis for only a small proportion of cities. Similar to our findings for Canada, relative prices are largely stationary for fresh pork products, Butter, Cheese, Eggs, and Potatoes. Interestingly, the proportion of cities for which the unit root can be rejected is relatively small for

[11]The extent of price convergence is similar when comparing across the complete range of goods. The unit root is rejected for less than 50% of the series for more than 2/3 of the goods categories.

Table 7: Mean Absolute Price Differential: Comparison with Ceglowski (2003)

Product	Full Sample (Monthly)	Full Sample (Biannual)	City Subsample (Monthly)	City Subsample (Biannual)	Ceglowski Mean
Sirloin steak	0.140	0.125	0.132	0.136	0.138
Round steak	0.129	0.124	0.125	0.132	0.130
Stewing beef	0.197	0.188	0.210	0.221	0.129
Pork Leg	0.129	0.098	0.113	0.100	0.112
Bacon, sliced	0.118	0.118	0.110	0.112	0.092
Eggs, fresh	0.147	0.157	0.132	0.143	0.120
Milk	0.152	0.133	0.130	0.106	0.162
Butter, creamery	0.069	0.063	0.068	0.064	0.060
Potatoes, 15lb bag	0.255	0.210	0.237	0.220	0.193
Soda biscuits	0.115	0.107	0.114	0.112	0.097
Flour	0.139	0.135	0.098	0.099	0.08
Salmon, canned	0.240	0.214	0.231	0.252	0.061
Tomatoes, canned	0.109	0.110	0.105	0.106	0.094
Sugar, granulated	0.075	0.073	0.073	0.072	0.181
Coffee	0.108	0.103	0.099	0.099	0.086
Tea	0.084	0.082	0.087	0.085	0.078
All Goods	0.133	0.123	0.127	0.122	0.121

Beef products, whereas rejection rates are high in Canada. It also appears that price convergence for canned and several dried goods is weak in the U.S. relative to other goods (except for Rolled Oats, Flour, and perhaps Rice, which show relatively strong convergence in the U.S.), in contrast to our findings for Canada. Comparing the overall U.S. ADF test results to our results for Canada indicates that there is more evidence of long-run convergence towards PPP in Canada. However, the longer time series considered in the case of Canada may account for part of this difference.

3.3. Interwar Intranational Integration vs Late 20th Century

A natural question is whether improvements in transportation and evolving retail market structures have reduced price differences across locations over time. Some insight into this question comes from comparing the interwar data to more recent estimates on average price differences across Canadian cities. Ceglowski (2003) examines average retail prices of 45 items across 25 Canadian cities over 1976:2-1993:2. Our sample has 18 goods in common with Ceglowski's data. Overall, the message is that market integration today is remarkably similar to that of the interwar period.

Table 7 reports the average MAPD for Canadian cities during the Interwar period (columns 1-4), as well as the averages reported by Ceglowski (2003) in the final column. Ceglowski's averages are based on biannual price observations (April and October) and a smaller sample of cities, so we also compare averages using biannual data and restricting attention to cities common to both data sets.[12] These averages are quite similar for most

[12]The restricted sample consists of 23 cities. Of the 25 cities considered in Ceglowski, Chicoutimi QB, St. Johns NF, and Thunder Bay are absent in our sample. Fort Williams is used to supplant Thunder Bay

Table 8: Distance and Price Dispersion in Canada: Comparison with Ceglowski (2003)

	1922-1940		1976-1993 (Ceglowski 2003)	
Product	Coefficient*	R-squared	Coefficient*	R-squared
Sirloin steak	0.80	0.52	1.80	0.62
Round steak	0.90	0.44	1.80	0.46
Stewing beef	1.84	0.39	2.30	0.52
Leg	1.18	0.54	1.40	0.63
Bacon sliced	3.63	0.67	1.40	0.52
Canned salmon	3.45	0.41	1.30	0.54
Eggs cooking	1.58	0.44	2.00	0.52
Butter creamery	1.11	0.48	0.40	0.87
Cheese	1.60	0.56	1.80	0.53
Soda biscuits	1.68	0.71	1.60	0.52
Flour	3.73	0.44	1.70	0.37
Tomatoes canned	3.09	0.56	2.30	0.64
Onions	2.88	0.54	2.50	0.45
Potatoes 15lb	4.92	0.69	5.50	0.69
Sugar granulated	1.16	0.41	3.60	0.64
Coffee	1.58	0.47	1.30	0.66
Tea	1.45	0.50	1.70	0.70
Pooled with Product dummies	2.02	0.45	2.20	0.5

* All coefficient estimates are significant at the 1% level. They have been scaled upward by a factor of 100 for clarity in presentation.

goods, particularly when comparing averages for the common city, biannual samples.[13] However, there are significant differences for some goods. Average price dispersion appears to be substantially higher during the interwar period in the cases of Stewing Beef, Canned Salmon, and Eggs, while dispersion is much lower in the cases of Milk and Sugar. On average for all goods, however, the MAPD during the interwar period (0.122) using Celglowski's city sample is nearly identical to her estimate (0.121).

Some sense of how U.S. city price deviations compare to more recent gaps can be also gleaned from Parsley and Wei (1996). They examine quarterly data on retail prices of 51 goods and services from 1975:1-1992:4 for 48 cities.[14] The mean price deviation in our sample is actually slightly less than that reported by Parsley and Wei (1996). For Perishables and Non-perishables, the mean average price deviation in our data is 0.135 and 0.109, versus 0.144 and 0.125.

Table 8 compares the Canadian sample distance coefficient estimates results to those of Ceglowski (2003) for goods that are in common with her data. The coefficients are, on average, similar to the Ceglowski (2003) estimates. The pooled-sample estimate of 2.02 is slightly smaller than the pooled estimates for Canadian cities in Ceglowski's analysis,

(the two cities are very close geographically). This results in 22 relative price series for the unit root tests.

[13]The standard deviations of the log price differential are also similar for most items. Averages are also similar to Parsley and Wei (1996) for U.S.. They report average values of 0.149 for perishable goods and 0.129 for non-perishables.

[14]The data was originally collected by the American Chambers of Commerce Researchers Association to compute their *Cost of Living Index* by city.

2.2 (once appropriately scaled). There are significant differences in coefficients corresponding to fresh meats; these are generally lower for the interwar period, except in the case of Bacon, in which case the coefficient is substantially larger. The difference in coefficient estimates is also quite large in the cases of Canned Salmon, Milk, Butter, Flour and Sugar. For the remaining goods, the estimates are quite similar.

This suggests that the decline in trade costs since the interwar period, inasmuch as it relates to distance traveled, has not been very significant overall in accounting for average price differences. That is, a 1 percent increase in the distance between two locations does not, on average, lead to smaller percentage change in absolute price differences across Canada during the interwar period compared to recent decades.[15]

Table 9 summarizes Parsley and Wei's estimates for comparison with respect to U.S. cities. It is interesting to observe that the effect of distance on price differences for perishable goods is stronger compared to non-perishables (looking at the first specification), whereas the opposite is found in Parsley and Wei (although the difference in their coefficient estimates is much smaller). Moreover, the relationship estimated for the second specification is concave in the case of Perishables, rather than convex. However, the pooled linear estimate using our data is reasonably close to the average of their estimates for perishables and non-perishables.

Has convergence to long run PPP has become more widespread since the interwar period? To answer this question, we compare the proportions of unit root rejections for Canada during this period to those reported by Ceglowski (2003) for the 1976-1993 period. To make our results as comparable as possible, we replicate the Ceglowski unit root tests using biannual price series for common in cities in both data sets. The number of years in Ceglowski's analysis – 17 years – is similar to the number of years of Canadian price data used here. Stationarity is also tested using different lag selection criteria, with little difference in the main conclusions.[16]

Columns 4-6 summarize the results for the interwar period using the restricted sample, and Columns 7-9 (Ceglowski, 2003) reproduce the percentage of unit-root rejections in Ceglowski's original analysis. There is no evidence of increased price convergence in the more recent 1976-1993 period considered by Ceglowski (2003). Out of the 15 common food items, the unit root is rejected more frequently in 9 cases during the early

[15]Table 20 in the appendix contains the coefficient estimates for the second specification, which includes the squared distance term. Table 21 includes a dummy variable to indicate whether cities within a pair both contain major ports. While ports significantly reduce price dispersion between cities, the inclusion of this variable does not change the main results.

[16]These include the Ng-Perron (1995) and Shwartz criterion. The generalized least squares unit root tests proposed by Elliott, Rothenberg and Stock (1996) was also used, which is similar to the ADF test, but has been shown to have the best overall performance when the sample size is small, and when an unknown trend is present. In terms of relative stationarity across goods categories, we can draw fairly consistent conclusions using the various tests for most goods (Mixed results were obtained only in the cases of Stewing Beef, Bacon, Flour, and Tea). However, specifications selected on the basis of the Ng-Perron test result in significantly fewer unit-root rejections than the SIC, as well as fewer rejections than the ADF test.

Table 9: Parsley and Wei (1996) Estimates for U.S. Cities

Variable	Perish.	Non-perish.	Perish.	Non-perish.
log distance	1.9e-02**	2.2e-02**	3.0e-02**	1.9e-02**
	(0.2e-03)	(0.4e-03)	(0.3e-03)	(0.5e-03)
log distance squared			-2.0e-03**	4.0e-04
			(0.4e-03)	(0.7e-03)
Obs.	705	1222	705	1222
R-squared	0.526	0.523	0.649	0.649

** significant at 1%

Table 10: Augmented Dicky Fuller Tests: Canada October 1922- October 1940

	Biannual Data (Ceglowski Sample)			Ceglowski (2003): Oct 1976-Oct 1992		
Product	N	5%	10%	N	5%	10%
Round steak	54	44	54	24	71	79
Stewing beef	50	54	60	24	33	46
Leg	36	78	83	24	29	33
Bacon sliced	55	56	64	24	54	71
Canned salmon	46	35	46	23	48	74
Eggs fresh	56	63	70	24	38	54
Milk, fresh	-	-	-	24	0	0
Butter creamery	59	68	71	24	25	29
Cheese	58	64	76	24	21	38
Flour	60	48	85	23	9	13
Tomatoes canned	60	73	82	24	38	50
Potatoes 15lb	50	78	86	24	96	96
Sugar granulated	59	76	83	24	29	58
Coffee	59	53	59	24	67	83
Tea	59	61	63	18	67	89

interwar period at both significance levels.[17] The long-run tendency towards purchasing power parity has, if anything, become weaker since the interwar period for most product categories. However, there is no evidence of a consistent trend across all product categories.

4 How Wide was the Border? Real Exchange Rates and the Canada-U.S. Border: 1922-1936

The quantitative importance of the Canada-U.S. border on relative prices, market integration and trade flows has been the subject of considerable debate. In this section, we examine the impact that the Canada-U.S. border has on relative prices across Canadian and U.S. cities of the 25 common retail food prices. We find that the the Great Depres-

[17] The proportions of rejections in our restricted sample are often substantially lower in comparison to the monthly data tests, confirming that the power of the test is influenced significantly by the length of the time series. Although our Canadian monthly data includes prices for Milk, no city prices represented a continuous series over the entire sample period for this item.

sion coincides with a “thickening" of the border, as the dispersion of relative prices for international city pairs increases. Interestingly, while nominal exchange rates fluctuations initially translate quickly into real exchange rate movements, we find these real exchange rate movements persist even after the Canada-U.S. nominal exchange rate returns to parity.

We begin by examining the October 1922- July 1930 period, for which we have monthly price data for both countries. Although Canada was formally on the Gold Standard only for part of this period (July 1926-January 1929), there was little nominal exchange rate volatility before 1931 (see Figure 1). Moreover, this sample period precedes the widespread increases in trade barriers. This is followed by an analysis of annual average price data, extending through until 1936, permitting interesting comparisons of the impact of trade barriers and exchange rate volatility on average international price dispersion.

4.1. Monthly Data: October 1922- July 1930

We examine average relative price differences across both international and within-country city pairs by comparing the mean absolute price differentials, $\tilde{q}_{ij}$, for each good, where we use Chicago as the benchmark city for U.S. city pairs and Toronto as the benchmark Canadian city (these cities also serve as benchmarks for cross-border pairs when calculating average international price differences). The mean and standard deviation of average prices across cities, for both perishable and non-perishable goods, are very similar in Canada and the U.S. (see Table 11). The average absolute price deviation across the 25 items is 0.104 in the U.S. versus 0.101 in Canada, with the average $\tilde{q}_{ij}$ for perishables slightly lower in Canada (0.117 versus 0.120), whereas it is slightly higher for non-perishable goods (0.090 versus 0.082). It is worth noting that there are larger cross-country differences at the good level. Significantly smaller Canadian averages for many meat categories account for the lower perishable average, while the average price dispersion for canned goods is higher in Canadian cities. For Canada, Potatoes has the highest average (0.226), and the food category with the lowest average is Butter (0.049). The food category with the highest average in the U.S. is Sirloin Steak (0.193), also having the highest variance, followed by Potatoes (0.177), and the food category with the lowest average is butter (0.053), which also has the lowest variance.

One potential issue is that U.S. cities tend to be larger than Canadian cities. To explore whether this is a significant factor, we also report the mean absolute price deviations across cities with populations exceeding 100,000 in 1930/31. While 45 of the 51 U.S. cities in our sample had populations exceeding this threshold, only 7 Canadian cities do.[18] As a result, restricting attention to large U.S. cities does not influence these averages much, with slightly lower average price differences for most goods. However, for the “large” Canadian city group, average price differences are roughly 25% lower, with an

[18] The Canadian cities are Hamilton, Montreal, Ottawa, Quebec, Toronto, Vancouver and Winnipeg.

Table 11: Monthly $\tilde{q}_{ij}$ (Oct 1922- July 1930)

	U.S. Cities				Canadian Cities			
	All Pairs		Pop > 100k		All Pairs		Pop > 100k	
Product	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Sirloin Steak	0.193	0.104	0.181	0.104	0.115	0.094	0.090	0.082
Round Steak	0.131	0.087	0.125	0.087	0.095	0.058	0.066	0.050
Rib Roast	0.159	0.080	0.154	0.080	0.136	0.091	0.089	0.065
Shoulder Roast	0.128	0.067	0.121	0.063	0.115	0.050	0.086	0.060
Stewing Beef	0.105	0.064	0.103	0.066	0.154	0.093	0.159	0.113
Mutton Leg	0.063	0.033	0.063	0.034	0.145	0.077	0.114	0.065
Bacon, sliced	0.120	0.059	0.117	0.058	0.100	0.058	0.075	0.057
Ham, sliced	0.075	0.051	0.072	0.049	0.051	0.024	0.035	0.025
Salmon, canned	0.071	0.036	0.069	0.036	0.161	0.109	0.098	0.080
Lard	0.060	0.042	0.059	0.041	0.068	0.039	0.033	0.019
Eggs, fresh	0.142	0.066	0.144	0.068	0.128	0.063	0.062	0.046
Milk	0.118	0.085	0.114	0.081	0.132	0.082	0.074	0.057
Butter	0.053	0.024	0.053	0.025	0.049	0.024	0.033	0.024
Cheese	0.114	0.054	0.111	0.056	0.075	0.030	0.049	0.032
Flour	0.121	0.078	0.110	0.071	0.096	0.040	0.090	0.048
Rolled Oats	0.084	0.053	0.082	0.052	0.092	0.050	0.061	0.036
Rice	0.085	0.066	0.074	0.040	0.088	0.040	0.068	0.046
Peas, canned	0.085	0.050	0.086	0.052	0.109	0.060	0.068	0.055
Corn, canned	0.071	0.032	0.073	0.033	0.098	0.075	0.057	0.057
Onions	0.120	0.066	0.121	0.070	0.149	0.053	0.135	0.085
Potatoes	0.177	0.086	0.175	0.090	0.226	0.117	0.166	0.129
Prunes	0.102	0.065	0.100	0.060	0.101	0.039	0.082	0.057
Sugar	0.067	0.028	0.066	0.029	0.086	0.049	0.056	0.041
Coffee	0.061	0.039	0.059	0.032	0.079	0.048	0.031	0.034
Tea	0.065	0.045	0.063	0.045	0.066	0.040	0.051	0.044
Perishables	0.120	0.079	0.117	0.078	0.118	0.082	0.088	0.076
Non-perishables	0.082	0.058	0.079	0.054	0.090	0.064	0.058	0.049
All Goods	0.104	0.072	0.101	0.071	0.106	0.076	0.075	0.067
Dist to Benchmark	680	435	659	439	566	645	578	736
Observations	51		45		69		7	

average differential of 0.075 versus 0.106 for all Canadian cities. Furthermore, only one good (stewing beef) has a larger average price difference for the Canadian large population sub-sample.

As a robustness check, we calculate averages for the 8 largest and 8 smallest US cities (since even restricting attention to populations exceeding 100,000, there is still a relatively large amount of dispersion in US city populations compared to Canadian cities in this category). The average for all goods corresponding to the 8 largest U.S. cities was indeed smaller (0.075), equalling the average for the 7 largest Canadian cities, but the average for the smallest 8 US cities turns out to be larger (0.118). This is suggestive of a role for population levels (or population density) in accounting for some of the observed price differences, pointing to factors such as distribution networks and economies of scale, rather than relative differences in population (which might relate to relative differences in the price of the non-traded component of retail goods). The importance of population is something we explore further in the distance/border regressions.

Table 12 reports summary statistics for international city pairs (using Toronto as the

Table 12: Monthly $\tilde{q}_{i,j}$ for International City Pairs (Oct 1922- July 1930)

	U.S. Cities (Toronto Benchmark)				Canadian Cities (Chicago Benchmark)			
	All Pairs		Pop > 100k		All Pairs		Pop > 100k	
Product	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Sirloin Steak	0.235	0.190	0.240	0.185	0.405	0.116	0.432	0.122
Round Steak	0.349	0.155	0.353	0.153	0.372	0.100	0.383	0.077
Rib Roast	0.183	0.116	0.190	0.119	0.408	0.117	0.376	0.114
Shoulder Roast	0.328	0.110	0.337	0.110	0.397	0.112	0.457	0.090
Stewing Beef	0.119	0.066	0.116	0.067	0.175	0.099	0.195	0.104
Mutton Leg	0.226	0.064	0.223	0.066	0.289	0.129	0.303	0.125
Bacon, sliced	0.094	0.045	0.096	0.047	0.155	0.061	0.151	0.067
Ham, sliced	0.155	0.080	0.147	0.076	0.127	0.040	0.129	0.039
Salmon, canned	0.186	0.047	0.184	0.047	0.143	0.062	0.140	0.068
Lard	0.121	0.055	0.123	0.057	0.155	0.054	0.131	0.042
Eggs, fresh	0.194	0.043	0.195	0.045	0.161	0.043	0.144	0.049
Milk	0.148	0.099	0.135	0.089	0.187	0.102	0.166	0.087
Butter	0.192	0.039	0.190	0.040	0.160	0.043	0.173	0.034
Cheese	0.106	0.038	0.108	0.039	0.264	0.050	0.257	0.040
Flour	0.141	0.075	0.130	0.067	0.098	0.032	0.098	0.031
Rolled Oats	0.467	0.074	0.468	0.070	0.347	0.080	0.343	0.058
Rice	0.082	0.053	0.072	0.036	0.092	0.046	0.085	0.043
Peas, canned	0.120	0.082	0.120	0.084	0.087	0.029	0.066	0.016
Corn, canned	0.081	0.050	0.083	0.052	0.091	0.045	0.068	0.020
Onions	0.191	0.051	0.191	0.053	0.189	0.039	0.178	0.043
Potatoes	0.524	0.160	0.516	0.163	0.529	0.132	0.577	0.134
Prunes	0.165	0.064	0.169	0.065	0.158	0.048	0.167	0.069
Sugar	0.147	0.039	0.145	0.039	0.177	0.056	0.168	0.056
Coffee	0.075	0.035	0.075	0.036	0.167	0.053	0.114	0.039
Tea	0.262	0.077	0.261	0.077	0.241	0.065	0.237	0.049
Perishables	0.214	0.147	0.214	0.146	0.265	0.151	0.273	0.158
Non-perishables	0.166	0.125	0.164	0.125	0.151	0.095	0.137	0.092
All Goods	0.193	0.140	0.192	0.140	0.217	0.142	0.192	0.140
Dist to Benchmark	738		733		867		838	
Observations	51		46		69		9	

Benchmark for US cities, and Chicago as the benchmark for all Canadian cities). Overall, the mean and standard deviation of $\tilde{q}_{ij}$ across all goods categories are higher for international city pairs (0.217 for Canadian cities relative to Chicago, and 0.193 for U.S. cities relative to Toronto) than for intranational US and Canadian city pairs. Only in a few cases is the mean dispersion for a particular good lower than either the Canadian- or US-only average. Restricting attention to cities with populations exceeding 100,000 lowers these averages slightly, with large differences for some goods, but the discrepancy between international and intranational city pairs becomes even more pronounced owing to a larger reduction in intranational price dispersion.

An alternative way of eyeballing the data is to plot the distribution of good level real exchange rates. We plot three distributions: (i) the distribution of q_{ij} between all Canadian city pairs; (ii) the distribution of q_{ij} between all U.S. city pairs; and (iii) the distribution of q_{ij} between all U.S.-Canada city pairs. (These are consistently expressed as the ratio of the U.S. city price relative to the Canadian city price.) Figures 5(a) to 5(p) plot these distributions for the months of January and July for each year for which we have overlapping monthly data. These figures confirm our findings from examining city averages, indicating more dispersed prices between cross-border pairs compared to within-country pairs.

It is interesting to note that the equally weighted average price difference is close to zero in all periods for both international and intranational pairs. (The distribution for international pairs is slightly to the right of zero for several months examined, indicating that prices are slightly higher in the U.S. on average.) This is similar to what Crucini et al. (2005) found for European cities (in 1985), but contrasts Parsley and Wei (2001), who find that average goods prices in Japan (in 1990) are substantially higher than in the U.S. (resulting in an international relative price distribution centered far away from zero). However, it is worth noting that the real exchange rate differences can be quite large for some goods and city pairs.

Judging by these figures, the impact of the Canada-U.S. border on relative prices during the 1920s perhaps does not appear to be very large. In the next section, we seek to quantify the contribution of the border effect when the role of distance is explicitly taken into account.

4.2. Engel-Rogers Border Regressions

In the spirit of Engel and Rogers (1996), we augment the distance regressions from Section 3 to include a dummy variable to indicate international city pairings. Specifically, for each good, we estimate

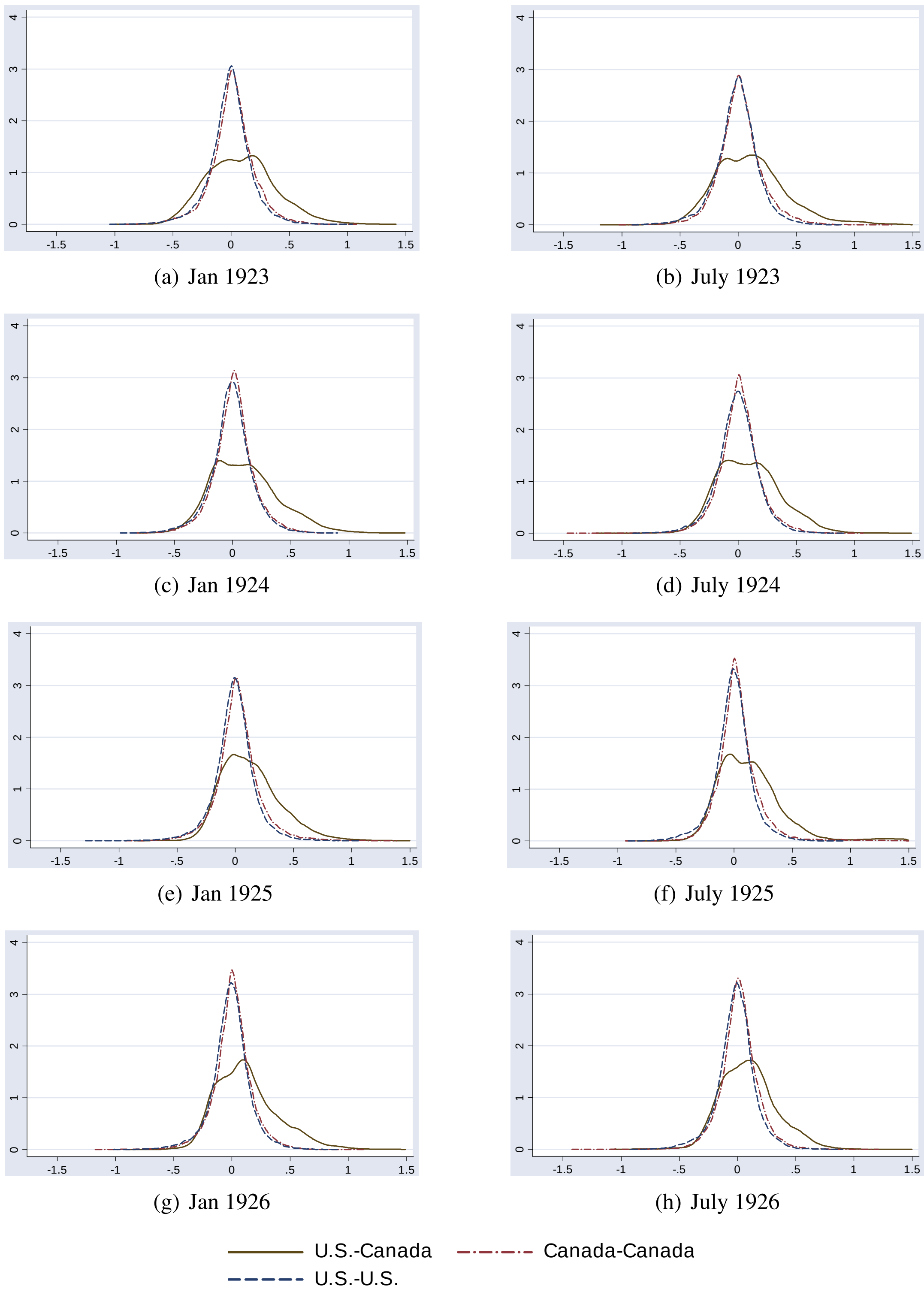
$$\tilde{q}_{ij}^{k} = \beta_0^k + \beta_1^k \ln\left(dist_{ij}\right) + \beta_2^k border_{ij} + \sum_{s=1}^{I+J-1} \delta_s^k d_s + \epsilon_{ij}^k \tag{4}$$

where $dist_{ij}$ and d_s are as described in the previous section, and $border_{ij}$ is equal to 1 if there is a national border between cities i and j and zero otherwise.

It is worth emphasizing that the interpretation of the border coefficient has been challenged in by Gorodnichenko and Tesar (2009), who highlight the identification problems in this approach. As a result, our regressions results are intended purely as a comparison with the more recent findings of Engel and Rogers (1996) and to illustrate the potentially large contributions of nominal exchange rate volatility and trade restrictions to the estimated border effect.

We use monthly data from October 1922 to July 1930 to estimate equation 4 for each of the 25 common goods. This is an interesting period to examine, as the nominal exchange rate was effectively fixed for the entire period. To the extent that nominal exchange rate volatility has been important in accounting for the sizeable border effect estimated for post-war periods, we are interested in whether the border appears to be less important, relative to the role of distance-related trade costs, in accounting for price dispersion prior to 1930. If policy-related barriers to trade are more important, we might instead expect the border to matter more during this period.

Figure 4: Kernel Density: Monthly Average Log Price Differences



(a) Jan 1923

(b) July 1923

(c) Jan 1924

(d) July 1924

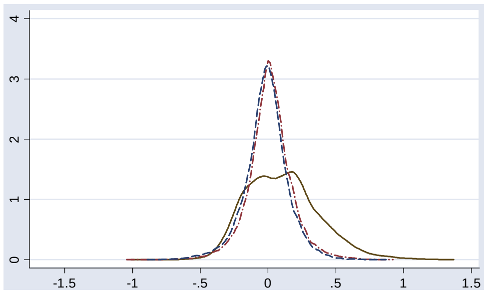
(e) Jan 1925

(f) July 1925

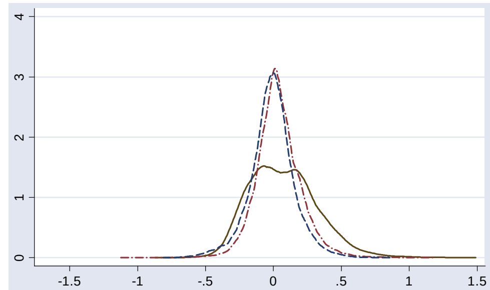
(g) Jan 1926

(h) July 1926

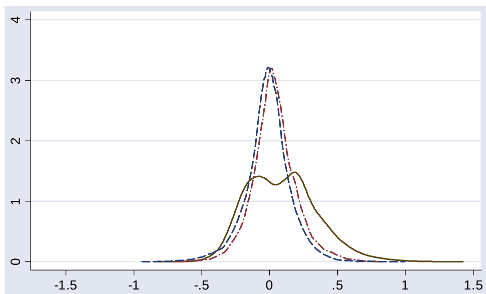
Figure 4: Kernel Density: Monthly Average Log Price Differences



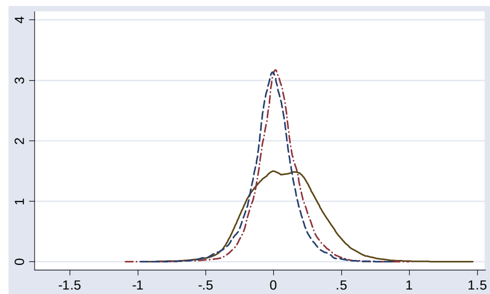
(i) Jan 1927



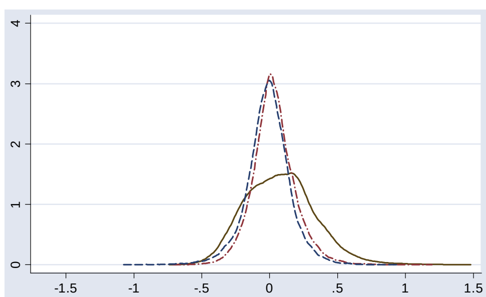
(j) July 1927



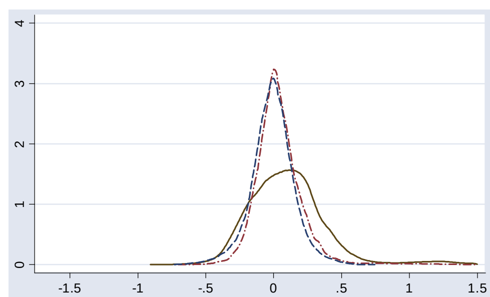
(k) Jan 1928



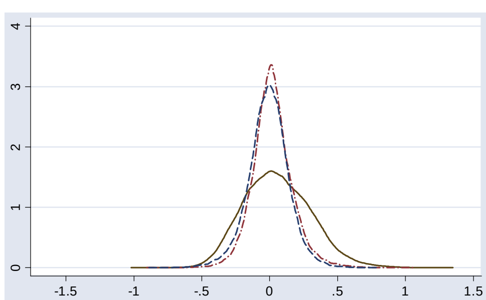
(l) July 1928



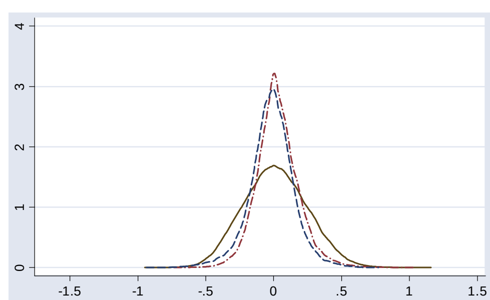
(m) Jan 1929



(n) July 1929



(o) Jan 1930



(p) July 1930

Table 13: Canada-U.S. Border Effect: October 1922- July 1930

Product	log distance	border	R^2	Border Effect (thousands of miles)
Sirloin Steak	1.451.E-02**	1.373.E-01**	0.67	14,333
Round Steak	1.400.E-02**	2.120.E-01**	0.71	4.200.E+07
Rib Roast	8.462.E-03**	1.378.E-01**	0.64	1.316.E+08
Shoulder Roast	1.185.E-02**	1.671.E-01**	0.67	1.482.E+07
Stewing Beef	1.434.E-02**	3.964.E-02**	0.46	17
Mutton Leg	2.456.E-02**	1.644.E-01**	0.66	898
Bacon, sliced	4.453.E-02**	7.800.E-03	0.54	0.0
Ham, sliced	6.303.E-03**	6.481.E-02**	0.66	32,543
Salmon, canned	1.047.E-02**	2.664.E-02**	0.53	13
Lard	5.930.E-03**	7.548.E-02**	0.6	3.757.E+06
Eggs, fresh	1.157.E-02**	4.343.E-02**	0.42	46
Milk	1.131.E-02**	4.320.E-02**	0.43	50
Butter	7.171.E-03**	1.276.E-01**	0.76	5.952.E+08
Cheese	2.347.E-03**	8.762.E-02**	0.7	1.82.E+16
Flour	1.649.E-02**	1.315.E-02**	0.44	1.4
Rolled Oats	5.949.E-03**	3.088.E-01**	0.85	3.89.E+22
Rice	9.311.E-03**	4.857.E-03**	0.32	0.8
Peas, canned	1.560.E-02**	-2.660.E-03+	0.26	-0.2
Corn, canned	2.066.E-02**	7.730.E-03	0.36	0.0
Onions	1.827.E-02**	3.660.E-02**	0.55	7.1
Potatoes	5.254.E-02**	2.763.E-01**	0.99	213.1
Prunes	5.101.E-03**	1.905.E-02**	0.47	46
Sugar	4.676.E-03**	6.036.E-02**	0.58	4.480.E+06
Coffee	8.413.E-03**	1.466.E-01**	0.72	4.118.E+08
Tea	7.839.E-03**	2.838.E-02**	0.53	40
All Goods	1.366.E-02**	9.016.E-02**	0.54	818

Significance levels : $+$: 10% $*$: 5% $**$: 1%

We find a much smaller border effect than the Engel and Rogers estimate for the 1978-1994 period. Table 13 presents the baseline results from the distance and border regressions using monthly data. The results from pooling all product categories (and including product dummy variables) are reported in the bottom row. According to these pooled estimates, the "width" of the border is equivalent to $\bar{distance} \times [\exp(\beta_2/\beta_1) - 1] = 1114 \times [\exp(9.016/1.366) - 1] = 818,000$ miles, where the average distance between international city pairs is 1114 miles. Although this number is large, it is much smaller than the Engel and Rogers (1996) estimate of 101,000,000 miles, or Parsley and Wei's estimate of the border effect between the U.S. and Japan.[19] It is also considerably less than the 5 Billion mile estimate Engel and Rogers estimate for the "Food at Home" goods category.

Interestingly, the importance of distance is much higher for some goods (such as most meats, milk, eggs, and canned goods). However, in the case of beef products, the role of the border is also large, resulting in a high border effect. The highest border effects relate

[19]As Parsley and Wei (2001) point out, using the original calculation used in Engel and Rogers leads to border effect estimates that are unaffected by the units of measurement used (Engels and Rogers in fact estimate the border to be 75,000 miles). They propose this alternative measure based on the average distance that should be added between cross-national city pairs in order to generate the amount of price dispersion observed.

Table 14: Canada-U.S. Border Effect with Rel. Population: Oct 1922- July 1930

Product	Log Distance	Border	Population Ratio	R^2	Border Effect (thousands of miles)
Sirloin Steak	1.418.E-02**	1.378.E-01**	2.430.E-03	0.67	18,505
Round Steak	1.468.E-02**	2.262.E-01**	-5.420.E-03**	0.72	5.48.E+07
Rib Roast	1.030.E-02**	1.198.E-01**	1.261.E-02**	0.65	1.254.E+06
Shoulder Roast	1.212.E-02**	1.779.E-01**	-5.739.E-03**	0.68	2.64.E+07
Stewing Beef	1.426.E-02**	4.161.E-02**	-1.360.E-03	0.47	19
Mutton Leg	2.079.E-02**	1.696.E-01**	-5.508.E-03**	0.68	3,887
Bacon, sliced	4.412.E-02**	-2.610.E-03	2.711.E-03**	0.55	0.0
Ham, sliced	7.410.E-03**	7.397.E-02**	-6.018.E-03**	0.67	24,110
Salmon, canned	9.574.E-03**	3.099.E-02**	-2.270.E-03**	0.54	27
Lard	6.300.E-03**	7.021.E-02**	5.624.E-03**	0.62	77,064
Eggs, fresh	1.297.E-02**	3.629.E-02**	4.404.E-03**	0.42	17
Milk	9.593.E-03**	4.829.E-02**	-7.951.E-03**	0.46	170
Butter	6.896.E-03**	1.339.E-01**	-3.537.E-03**	0.76	3.01.E+09
Cheese	1.450.E-03*	7.998.E-02**	4.860.E-03**	0.71	1.00.E+24
Flour	1.700.E-02**	2.014.E-02**	-5.927.E-03**	0.46	2.5
Rolled Oats	6.142.E-03**	3.283.E-01**	-8.211.E-03**	0.86	1.82.E+23
Rice	9.418.E-03**	7.739.E-03**	-4.407.E-03**	0.38	1.4
Peas, canned	1.755.E-02**	-5.769.E-03**	2.029.E-03**	0.27	-0.3
Corn, canned	2.254.E-02**	-7.226.E-03**	4.459.E-03**	0.37	-0.3
Onions	1.809.E-02**	4.205.E-02**	-2.505.E-03**	0.55	10.3
Potatoes	5.094.E-02**	2.965.E-01**	-1.211.E-02**	0.69	374.5
Prunes	5.672.E-03**	2.165.E-02**	-1.692.E-03**	0.48	50
Sugar	4.858.E-03**	4.030.E-02**	1.493.E-02**	0.64	4,462
Coffee	7.638.E-03**	1.462.E-01**	5.20.E-04	0.73	2.29.E+09
Tea	7.358.E-03**	4.421.E-02**	-1.043.E-02**	0.53	452
All Goods	1.364.E-02**	9.189.E-02**	-7.833.E-04**	0.43	938

Significance levels : $+$: 10% $*$: 5% $**$: 1%

to rolled oats, cheese, butter and coffee. Non-perishable goods such as coffee and oats should be easily traded, raising the question of whether trade barriers payed an especially large role for these goods.[20] Very small border effects are observed for canned goods, and in the case of Canned Peas the border coefficient is modestly negative.

To examine the possible impact of differences in city size, we introduced the absolute difference of the log of the population ratio between city pairs in our regressions (see Table 14). While there are some differences in the border coefficients for some goods (e.g. smaller border effects for Rib Roast and Sugar, larger for Cheese), for most goods the average border effect changes little. While the expected sign of the coefficient on population differences was expected to be positive, it is very often negative (and typically significant) and we also obtain a negative coefficient for the pooled average.

[20]We were able to obtain U.S. tariff data for these goods, and these are actually quite small during this period. (For rolled oats, the period average effective tariff rate on imports from Canada is 6%, while no tariff is applied to coffee imports.) Non-tariff restrictions on trade may have been high, although we have found no evidence of this.

4.2.1 Border Cities

We also examine a subsample of cities that are geographically close to the Canada-U.S. border (see Table 22 in the Appendix). Our criteria selects city pairs that are within 500 km of the border, and have a population above 39,000 in 1930, which corresponds to the size of the smallest US city (Butte). The resulting subsample consists of 16 Canadian cities and 28 US cities. Pairs are constructed from cities that are relatively close to each other: Within-country cities are paired with their nearest neighbor, such that each adjoins two others (except for the endpoints), while international pairs are constructed by matching relatively near cross-border cities.[21] Within-country means and standard deviations of relative price differences for this subsample are reported in 23 in the Appendix. Not surprisingly, average price differentials are smaller for this sample. The differences in Canadian and U.S. sample moments are small for most items, especially in comparison with full sample averages.[22] With a few exceptions, the distributions of within-country relative price differences look very similar across countries for our border-city subsample.

Table 15 reports the regression results and border effect for the border-city sample. Qualitatively, the results are quite similar, but the border effect tends to be smaller with a pooled sample estimate of 265 thousand miles. This supports Gorodnichenko and Tesar's (2009) concern that the width of the border is potentially exaggerated by within-country heterogeneity in relative price distributions. The border effect is substantially larger for some goods: Rib roast, Mutton leg, and Flour and Canned peas. For each of these goods, however, the distance coefficient is not statistically significant from zero, so the estimated border effect is difficult to interpret. Nevertheless, the overall message is the same – the width of the border is low compared to the Engel and Rogers estimates.

While the 1920's period witnessed little nominal exchange rate fluctuations, this was not true of the 1930's. In Section 4.3. we turn to our annual data, which spans 1922-1936, and examine how nominal exchange rate fluctuations and trade policy changes mattered for the measured impact of the Canada-U.S. border.

4.3. Annual Data: 1922-1936

We ask whether the exit (at different times) from the gold standard (followed by fluctuations in the nominal exchange rate over 1931-1933) and rise in tariff barriers (in both countries) after July 1930 impacted the dispersion of prices across Canadian and U.S. city pairs. We examine the evolution of the distributions of within-country and interna-

[21]Each city is paired with at least one (and often two or more) cities in the other country, so that all cities in the subsample are linked together in a lattice-type pattern. Because the US subsample exceeds the Canadian subsample, Canadian cities are in many instances paired with two or more US cities, while several US cities are paired with only one Canadian city.

[22]The MAPD is approximately 8% for all goods in Canada and the U.S. and ranges between 3% and 18% (13.5%, if Potatoes in Canada is excluded). Only in the case of Mutton leg, Ham, Canned salmon, Milk, Onions, Potatoes and Tea does the difference between the MAPD in Canada and the U.S. exceed 2 percentage points.

Table 15: Canada-U.S. Border Effect: Border City Sample

Product	Log Distance	Border	Population Ratio	R^2	Border Effect (thousands of miles)
Sirloin Steak	4.431.E-02+	2.324.E-01**	-9.486.E-03**	0.82	47
Round Steak	5.012.E-02**	3.075.E-01**	-1.028.E-02**	0.85	116
Rib Roast	5.583.E-03	1.655.E-01**	5.088.E-03**	0.76	1.88.E+12
Shoulder Roast	3.165.E-02+	2.659.E-01**	-9.589.E-03**	0.78	1,117
Stewing Beef	1.842.E-02	8.834.E-02**	-4.382.E-03**	0.62	30
Mutton Leg	1.388E-02	1.637.E-01**	-5.098.E-03**	0.64	33,244
Bacon, sliced	9.187.E-03	1.658.E-02	8.658.E-04	0.62	1.3
Ham, sliced	8.158.E-03	6.800.E-02**	-4.043.E-03**	0.77	1,046
Salmon, canned	-1.013.E-03	9.275.E-02**	-3.019.E-03*	0.55	-
Lard	2.152.E-02**	5.602.E-02**	3.577.E-03**	0.69	3.1
Eggs, fresh	2.225.E-02**	7.466.E-02**	6.281.E-03**	0.58	6.9
Milk	3.238.E-02**	6.442.E-03	2.889.E-03*	0.51	0
Butter	7.610.E-03	1.528.E-01**	1.871.E-04	0.83	1.32.E+08
Cheese	5.575.E-03	1.068.E-01**	2.762.E-03**	0.85	5.25.E+07
Flour	3.177.E-03	3.252.E-02**	1.545.E-03+	0.42	7,000
Rolled Oats	-6.204.E-03	3.181.E-01**	5.471.E-04	0.88	-
Rice	5.755.E-03	1.063.E-02	-3.210.E-03**	0.45	0
Peas, canned	5.930.E-03	3.739.E-02*	-1.145.E-04	0.41	137
Corn, canned	1.222.E-02	2.342.E-02	1.406.E-03+	0.56	1.5
Onions	1.014.E-02+	4.452.E-02**	2.276.E-03**	0.68	20
Potatoes	6.231.E-02**	2.591.E-01**	-5.446.E-03**	0.80	16
Prunes	-5.911.E-03	3.091.E-02*	-2.068.E-03**	0.59	-
Sugar	1.987.E-02**	3.378.E-02**	1.227.E-02**	0.77	1.1
Coffee	1.535.E-02	1.519.E-01**	1.645.E-03+	0.80	4,981
Tea	1.547.E-02*	3.452.E-02**	-1.119.E-03+	0.65	2.1
All Goods	1.594.E-02**	1.110.E-01**	-6.351.E-04	0.47	265

Significance levels : + : 10% ∗ : 5% ∗∗ : 1%

tional average annual relative prices for all goods from 1922 to 1936. We also summarize changes in price dispersion over time for specific goods by calculating the mean absolute price differential for five, three-year subperiods; 1922-1924, 1925-1927, 1928-1930, 1931-1933, 1934-1936 (inclusive of 1936). We find that there was a significant rise in international price dispersion during the 1930s, and that this dispersion remained even after the nominal exchange rate had returned to par. Not surprisingly, this increased price dispersion leads to much larger border effects in our Engel and Rogers style regression for the post 1930 subperiod.

Figures 6(a)-6(n) plot the kernel densities for relative price deviations for all goods between cities for each year. The distributions of prices are very similar in Canada and the U.S. throughout most of the period, although prices tend to be slightly higher in the U.S. on average. Aside from a slight increase in the variance for the 1931-1933 sub-period, these within-country distributions are also remarkably stable from year to year. Examining relative prices for international city pairs, by contrast, we observe a significant upward shift in average U.S. city prices relative (as well as increased variance in international relative prices) from 1931 to 1933. We also observe, for at least a subset of goods, relative prices swinging in the opposite direction in 1933-34. However, U.S. relative prices tend to rise again in 1935 and by the end of the sample period prices remain high in the U.S. when compared to the 1920s.

The shifts in international relative prices between 1931 and 1934 coincide with the nominal exchange rate fluctuations. This rise in real exchange rates fluctuations as a following a shift from fixed to floating exchange rates is similar to the effect of the end of the Bretton Woods fixed exchange rate systems (Mussa, 1986). Figure 6 shows that the nominal Canada-U.S. exchange rate tracks the real exchange rate, measured by a simple average of cross-border price ratios, fairly well. However, Figure 6 also shows that relative prices in the U.S. begin to rise in 1930, prior to the movement in the nominal exchange rate in 1931. Moreover, relative prices in the U.S. are high in 1936 compared to the 1920s, despite the nominal exchange rate having returned to par in 1933.

The rise in import duties for many traded goods in Canada and the US in June/July 1930 may have played a role in these relative price movements. Although tariffs in both countries were lowered in 1934-1935 for much of Canada-U.S. trade (Figure 2), official rates were not reduced for most of the food items examined in our data. Therefore increases in tariff and non-tariff barriers could have contributed to an increase in relative price dispersion for the entire period after 1931, and potentially explains for the increased magnitude of international price deviations after 1933 compared to the years before 1931.[23]

In addition to an increase in average price differences, we observe a substantial increase in the standard deviation of relative prices across international city pairs in 1931 (Figure 7). Unlike average relative U.S. Canada prices, however, the variance of relative prices remains above the pre-1931 average for the entire 1931-1936 period. We also observe a very modest increase in within-country variation in relative prices in 1931, but the increase is much less pronounced and variation begins to decrease again after 1933.

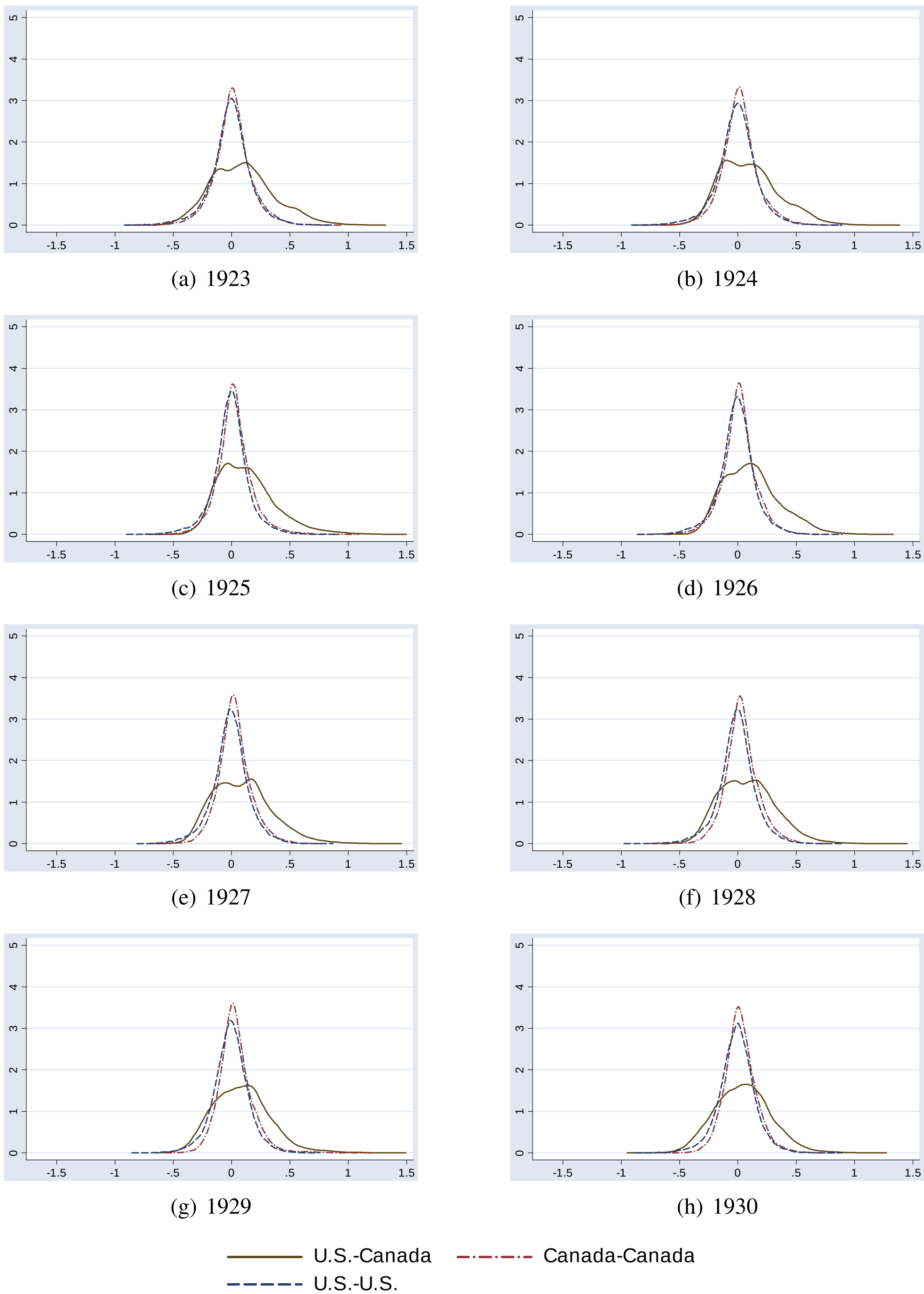
This persistent increase in the international wedge between city prices for several goods following the stabilization of the nominal exchange rate is apparent in the mean absolute price differential. Averages for the mean absolute price differential for various sub-periods based on annual data are presented in Tables 24-26 of the Appendix. Tables 24 and 25 compare averages within Canada and within the U.S. across sub-periods for all city pairs. We note that, in all except the 1934-1936 subperiod, average price dispersion is similar in Canada and the U.S. with slightly higher average dispersion overall in the U.S.. (For 1934-36, average price dispersion is quite a bit lower in the U.S..) However, there are several differences across goods.[24] Overall, relative prices also tend to be more dispersed in the 1931-1933 subperiod for both Canadian and U.S. city pairs.[25] The rise

[23]Alternatively, very slow price adjustments to the appreciation of the Canadian dollar towards the end of 1933 could also be a factor.

[24]Average dispersion is substantially higher for U.S. city pairs in the cases of Sirloin and Round Steak, Sliced Ham, Eggs Prunes and Tea. However, price dispersion tends to be lower on average in the U.S. for all other fresh meats, as well as for butter and Canned Corn.

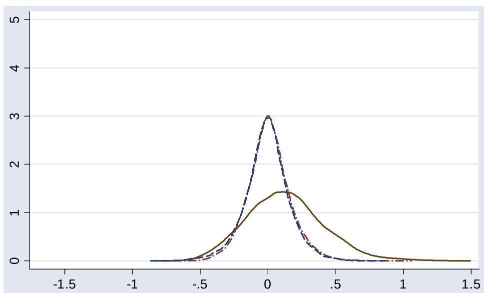
[25]There are, however, a few instances in which the MAPD is larger in 1931-1933 relative to the previous

Figure 5: Kernel Density: Annual Average Log Price Differences

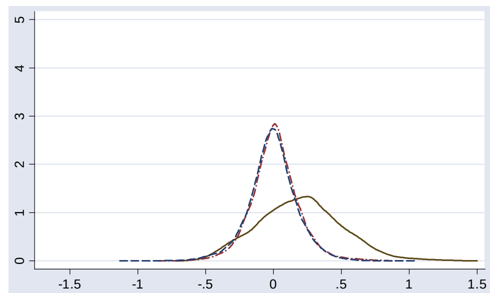


(a) 1923 (b) 1924 (c) 1925 (d) 1926 (e) 1927 (f) 1928 (g) 1929 (h) 1930

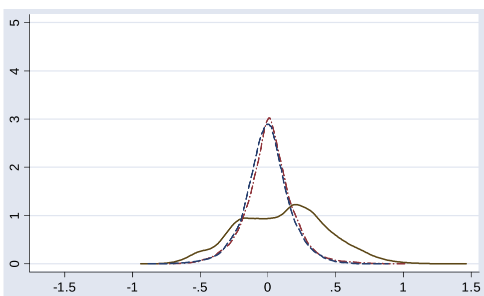
Figure 5: Kernel Density: Annual Average Log Price Differences



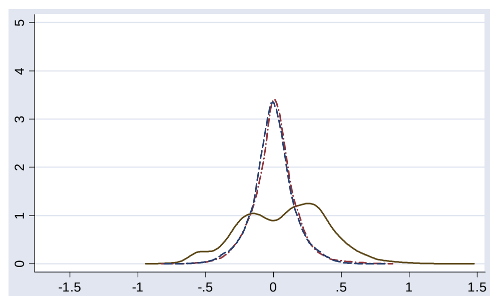
(i) 1931



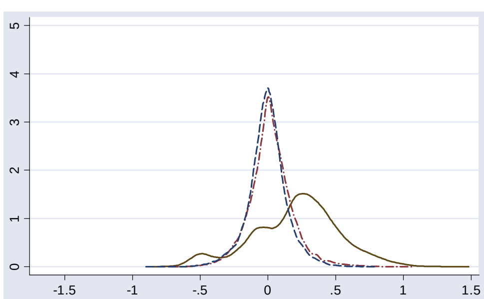
(j) 1932



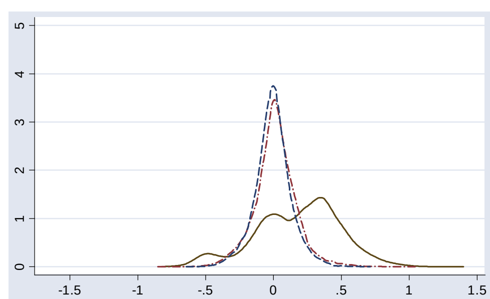
(k) 1933



(l) 1934

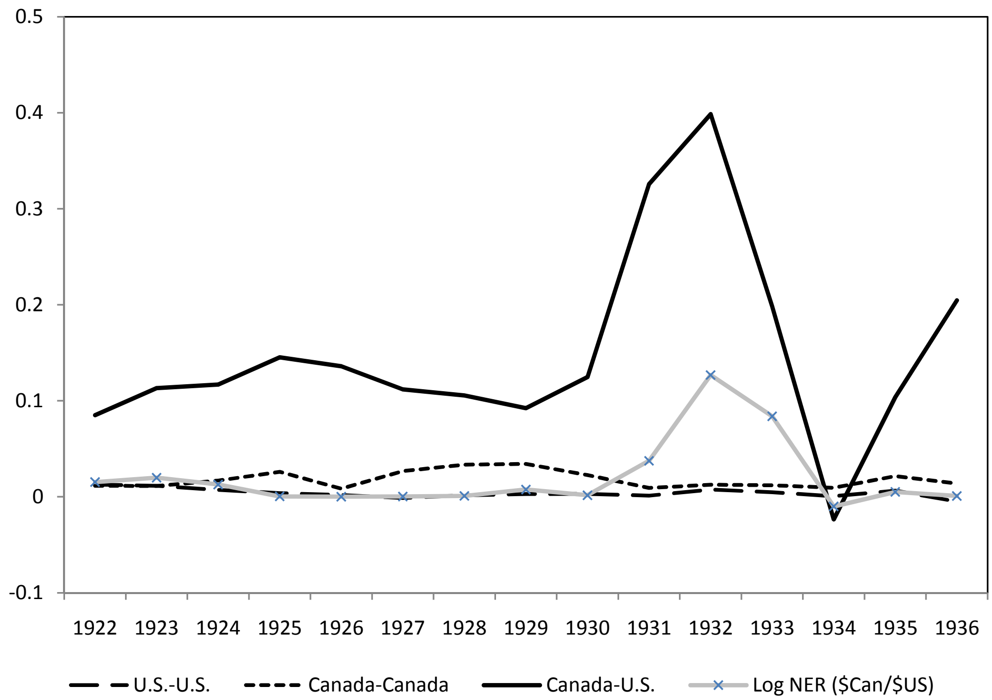


(m) 1935



(n) 1936

Figure 6: Annual Average Real and Nominal Exchange Rates



in price dispersion in 1931-1933 disappears in 1934-1936 for U.S. cities, and also falls considerably for Canadian cities.[26]

Examining average price dispersion between international city pairs, we also observe a marked increase in the 1931-1933 subperiod but, in contrast to within-country pairs, dispersion remains high in the 1934-1936 subperiod. Table 26 presents averages for international city pairs. Not surprisingly, these averages tend to be large compared to within-country averages. (Only in a few cases – notably Canned Salmon and Canned Corn in Canada and Eggs and Tea in the U.S. – is the average for international pairs lower than the within-country average). The MAPD for all goods increases by almost 40% in 1931-1933 over the previous sub-period, and rises further during 1934-1936.

We quantify the effect of the border on these average price differences by introducing a border dummy into the regression of mean absolute price differential on distance.

subperiod – for Canada, these cases are Mutton, Bacon, Potatoes and Sugar, and for the U.S. there are modest declines in the MAPD in the cases of Sirloin and Round Steak, Canned Peas and Tea.

[26]Because of the potential importance of population for retail price differences and noted in the previous section, and because Canadian cities in our sample are much smaller on average during this time period, we also compared the mean absolute price differential for cities with populations greater than 100,000. Apart from a reduction in the Canadian averages, the picture we obtain from the restricted sample was the same – average within-country price dispersion falls very gradually throughout the 1920s, rising in 1931-1933, and falling again in 1934-1936.

Figure 7: Standard Deviation of Relative Prices

To evaluate changes in the relative size of the border over time, we compute the mean absolute price differential across all city pairs for 1922-1924, 1925-1927, 1928-1930, 1931-1933, and 1934-1936, and for each good, we estimate

$$\tilde{q}_{ij,t} = \beta_0 + \sum_{t=1}^{5} \beta_{1,t}\Big(\ln dist_{ij} \times \iota_t\Big) + \sum_{t=1}^{5} \beta_{2,t}\Big(border_{ij} \times \iota_t\Big) + \sum_{s=1}^{I+J-1} \delta_s d_s + \epsilon_{ij,t} \quad (5)$$

where ι_t is dummy for sub-period t. As in the previous sections, we also conduct the regression for the pooled sample of goods, adding dummy variables for each good. We are particularly interested in how much the border effects have increased in sub-periods 1931-1933 and 1934-1936, marking periods of increased exchange rate volatility and increased trade restrictions between the two countries.

We first estimate (5) using the full sample of cities with populations exceeding 50,000 in 1930/31 (see Table 27). The border effect is calculated using the average distance between international city pairs, as $1096 \times \left(e^{\beta_{2,t}/\beta_{1,t}} - 1\right)$. Examining the border effects, one pattern that emerges is a rise in the estimated border effect for 1931-1934. In almost all cases (except Milk, Rice, Prunes and Tea) the border effect is even higher for the

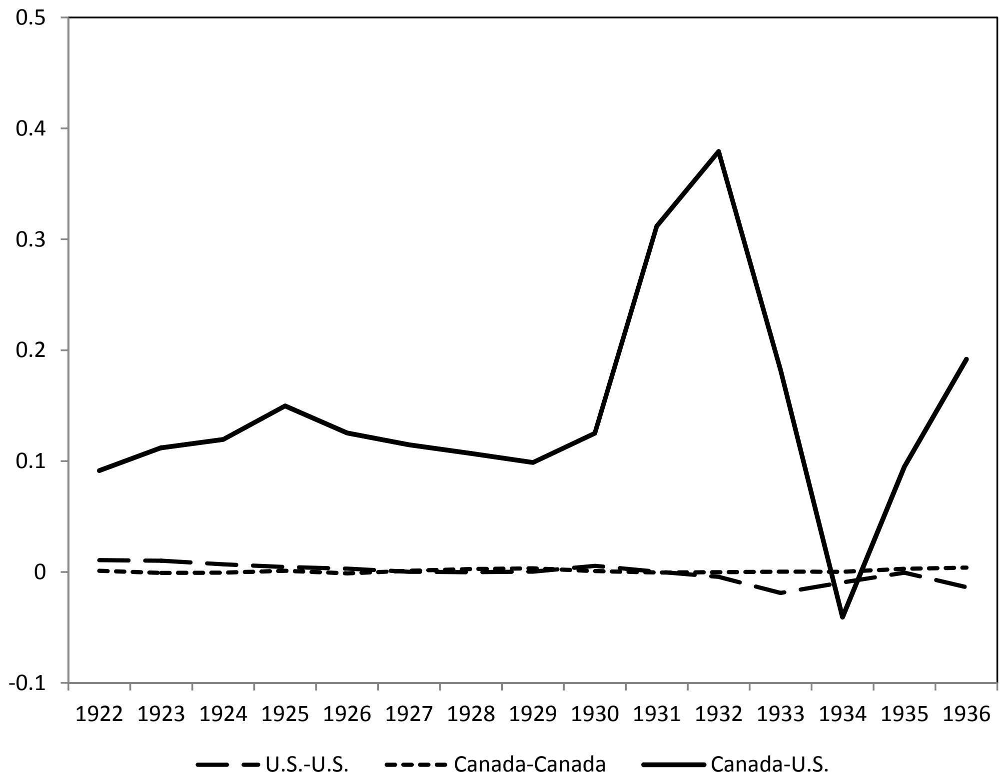
1934-36 period. Looking at the pooled estimates, the border effect for 1934-1936 is several times higher than the 1931-1933 estimate, and is 40-100 times higher than the pre-1931 estimates.

Due to the timing of exchange rate and trade policy changes, it is difficult to directly separate out their relative contribution to higher international price dispersion. However, that the border effect continues to rise after the exchange rate stabilizes indicates that changes in international trade likely played a significant role. The increase in duties would have become gradually more relevant throughout the first half of the 1930s owing price deflation since many import duties are set on volumes. As Crucini (1994) points out, because many duties during the Great Depression were applied to quantities rather than value, it is therefore necessary to consider changes in the ad valorem equivalents when measuring barriers to trade. Although official import duties in the U.S. were held at a constant rate for most goods following the July 1930 increase (the only exceptions are Canned Peas, for which duties were lowered in 1935, and Canned Meats, for which duties were raised in 1935), the deflations in both countries during this period means that, given that most items considered were subject to volume-based duties, the equivalent ad valorem (EAV) rates would have increased. EAV tariff rates are computed for the U.S., based on aggregate trade statistics and duties, and presented in Table 29. This may have resulted in larger retail price gaps, exacerbating any impact of nominal price rigidities.

Looking at our pooled estimates, the 3 million mile border effect for the 1934-1936 sub-period remains substantially smaller than Engel and Rogers' 101 million mile estimate. There are substantial differences in estimated border effects for different goods. The border effect is surprisingly small (and in one sub-period, even negative) for Canned Peas and Corn prior to 1931. However, the border effect for Canned Peas blows up after 1931, while Canned Corn exhibits a relatively modest rise. Overall, the largest estimates are for Mutton Leg, Butter, Rolled Oats, and Coffee. Although the border dummy estimates are comparatively large for these items, for Mutton Leg, Butter and Coffee the estimated effects of distance are so small that they would translate even quite modest border coefficients into sizeable border effects. In other words, the relatively small impact of distance on average price dispersion in these cases implies that border-related costs become gigantic in distance-related terms.

The reason for the negative impact of the border in a couple of instances is not clear. One reason we might expect to observe a negative impact of the border, having controlled for distance, is where the good is predominantly shipped by sea, and where the average distance between port cities in both countries is less than the average intranational city distance in each country. In this case any price shocks between port cities would be more highly correlated with each other than price shocks between port and non-port cities, and the border is potentially picking up the effect of lower average international distances between port cities compared to average intranational distances between port and non-port cities. To test this, we included a dummy variable in the regressions indicating whether a deep sea port exists in both cities in the pair. This dummy variable was interacted with the distance variable to capture the offsetting negative effect that ports might have on

Figure 8: Average Relative Prices: Border Cities



trade costs.[27] Although the variable had a significant negative effect on average price dispersion in several cases, including it had very little effect on the point estimates. In particular, the border dummy coefficient remained negative and significant in the cases of Canned Peas and Tea.[28]

4.3.1 Border Cities

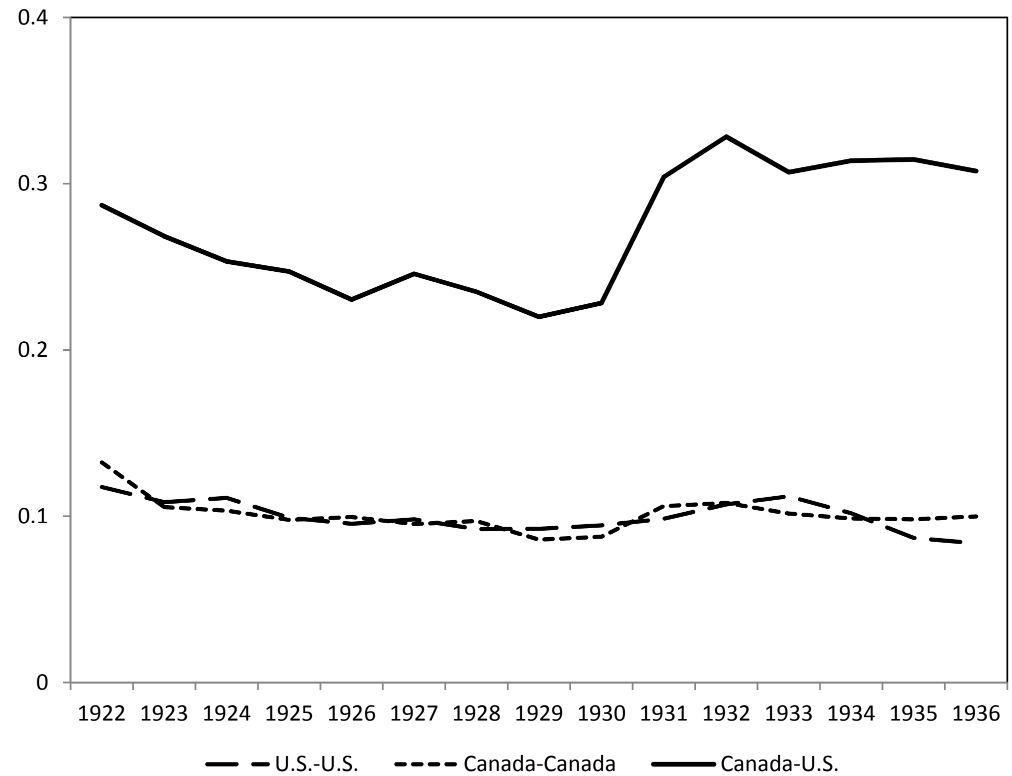
The abnormally large border effects for some goods raises the concern that this measure is also picking up differences in the within-country relative price distributions. Following our approach in Section 4.2., we estimate the border effect for the subsample of geographically proximate cities near the border.

Figure 8 illustrates the average within-country and and international relative prices

[27]Port information obtained from "World Port Source" online database (http://www.worldportsource.com/ports/). These refer to ports in existence at the beginning of the sample period. Ports listed are sea ports. River ports, such as Port of Little Rock and Port of Cincinnati, are excluded.

[28]These estimates are not presented here to conserve space, but are made available on the author's web site.

Figure 9: Standard Deviation of Relative Prices: Border Cities



across cities and retail items. The pattern in average international relative prices is similar to the full sample average. The average standard deviations of relative prices for within-country and international city pairs are illustrated in Figure 9. These figures illustrate two key points. First, average within country variation in relative prices is almost identical in both countries over the sample period, suggesting that within-country relative price distributions are similar in both countries for the border city subsample. Second, although average variation in international prices is smaller for the subsample of geographically proximate cities, as one would expect, the dynamic pattern in average relative price variation does not differ from the pattern observed for the full sample.

Similarity in the patterns of average international relative prices and the average standard deviation for both samples reflects similar dynamics in the border effect over time. Table 28 reports the regression results for our border city sample. The overall pattern over time is the same – the estimated border effect is still substantially higher for the 1831-1934 sub-period compared to previous periods, and is many times higher still for the 1934-1936 period. This supports the notion that trade tariffs and other trade barriers matter the most in terms of changes to international market integration during this period, as measured by the border effect. However, differences in magnitude highlight how sensitive this measure is to within-country price differences, as pointed out by Gopinath et al. (2009) and Gorodnichenko and Tesar (2009).

5 Conclusions

This paper assembles a unique data set of average retail price data for a panel of 69 Canadian and 51 U.S. cities during the interwar period in order to examine deviations from the law of one price at the retail level in North America during the Interwar period. Somewhat surprisingly, we find that deviations from the law of one price across North American cities during the Interwar period were very similar to those observed at the end of the 20th century. Estimates of relative price dispersion are very similar to those obtained in studies that have focused on price differences in Canada and the U.S. for the postwar period. We also find that, looking across all goods categories, the impact of distance-related trade costs on relative price dispersion is similar to estimates corresponding to the postwar period. Consistent with studies that have looked at direct measures of shipping costs, our analysis does not provide any evidence that distance-related trade costs have been a key factor in explaining increased market integration over the past century. However, these comparisons reveal some significant differences in the importance of distance for price differences of individual goods.

Our analysis also highlights the roles played by nominal exchange rate volatility and trade policy in affecting real exchange rate movements. The 1920s were a period during which the Canada-U.S. nominal exchange rate was relatively constant (largely due to the Gold Standard). During this time period, the Canada-U.S. border had a relatively small impact on law of one price deviations across Canadian and U.S. cities. However, the nominal exchange rate fluctuations combined with increased trade barriers of the early 1930s did result in large international real exchange rate price movements. Barriers to trade, which worsened throughout the first half of the 1930s as a result of deflation and specific duties on several of the goods examined, appear to matter the most in this relationship. Several years after the Canada-U.S. nominal exchange rate returned to parity in 1933, the international price dispersion still remains high when compared to the 1920s. For most retail goods examined, this is reflected in substantial increases in border effect estimates towards the end of the sample period, indicating that the disintegration of these markets is important in explaining real exchange rate movements during 1930s.

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A Tables and Figures

Table 16: Product List: Canadian Data

Bacon, sliced	Peaches canned
Bacon, not sliced	Peas, canned
Beans, dry	Potatoes, 100lb bag
Bread	Potatoes, 15lb bag
Butter, creamery	Prunes
Butter, solid	Raisins
Cheese	Rib roast
Coffee	Rice
Corn syrup	Rolled oats
Corn, canned	Round steak
Currants	Salmon, canned
Eggs, cooking	Salt mess pork
Eggs, fresh	Shoulder roast
Flour	Sirloin steak
Ham sliced	Soda biscuits
Jam	Stewing beef
Lard	Sugar, granulated
Leg	Sugar, yellow
Marmalade	Tapioca
Milk	Tea
Mutton leg roast	Tomatoes canned
Onions	Veal shoulder

Table 17: Product List: U.S. Data

Bacon, sliced	Mutton leg
Beans, baked	Onions
Beans, navy	Oranges
Bread	Peas, canned
Butter, creamery	Pork chops
Cabbage	Potatoes
Cheese	Prunes
Coffee	Raisins
Corn flakes	Rib roast
Corn meal	Rice
Corn, canned	Rolled oats
Eggs, fresh	Round steak
Flour	Salmon, canned
Ham, sliced	Shoulder roast
Hens	Sirloin steak
Lard	Stewing Beef
Macaroni	Sugar, granulated
Margarine	Tea
Milk, evaporated	Veg. lard substitute
Milk, fresh	Wheak cereal

Table 18: Population in Canadian Cities (1931 Census)

Amherst, NS	7,450	Oshawa, ON	23,439
Bathurst, NB	-	Ottawa, ON	126,872
Belleville, ON	13,790	Owen Sound, ON	13,448
Brandon, MB	17,082	Peterborough, ON	22,327
Brantford, ON	30,107	Port Arthur, ON	19,818
Brockville, ON	9,905	Prince Albert, SK	10,300
Calgary, AB	83,761	Prince Rupert, BC	6,350
Charlottetown, PEI	12,839	Quebec, QC	130,594
Chatham, ON	14,569	Regina, SK	53,209
Cobalt, ON	3,885	Saint John, NB	47,514
Drumheller, AB	2,987	Sarnia, ON	18,191
Edmonton, AB	79,197	Saskatoon, SK	43,291
Fernie, BC	2,732	Sault Ste. Marie, ON	22,327
Fort William, ON	26,277	Sherbrooke	28,933
Fredericton, NB	8,858	Sorel	13,790
Galt, ON	14,006	St. Catharines, ON	24,753
Guelph, ON	21,075	St. Hyacinthe	13,489
Halifax, NS	59,275	St. Thomas, ON	15,430
Hamilton, ON	155,547	St.Johns, QC	-
Hull, QC	29,433	Stratford, ON	17,742
Kingston, ON	23,439	Sudbury, ON	18,518
Kitchener, ON	30,793	Sydney, NS	23,089
Lethbridge, AB	10,320	Thetford Mines, QC	11,395
London, ON	71,148	Three Rivers	35,450
Medicine Hat, AB	10,701	Timmins, ON	14,200
Moncton, NB	20,689	Toronto, ON	631,207
Montreal, QC	818,577	Trail, BC	7,573
Moose Jaw, SK	21,299	Truro, NS	7,901
Nanaimo, BC	6,745	Vancouver, BC	246,593
Nelson, BC	5,992	Victoria, BC	39,082
New Glasgow, NS	8,858	Windsor, NS	3,032
New Westminster, BC	17,524	Windsor, ON	63,108
Niagara Falls, ON	19,046	Winnipeg, MB	218,785
North Bay, ON	15,528	Woodstock, ON	11,395
Orillia, ON	8,830		

Table 19: Population in U.S. Cities (1930 Census)

Atlanta, GA	270,366	Minneapolis, MN	464,356
Baltimore, MD	804,874	Mobile, AL	68,202
Birmingham, AL	259,678	Newark, NJ	442,337
Boston, MA	781,188	New Haven, CT	162,655
Bridgeport, CT	146,716	New Orleans, LA	458,762
Buffalo, NY	573,076	New York, NY	6,930,446
Butte, MT	39,532	Norfolk, VA	129,710
Charleston, SC	62,265	Omaha, NE	214,006
Chicago, IL	3,376,438	Peoria, IL	104,969
Cincinnati, OH	451,160	Philadelphia, PA	1,950,961
Cleveland, OH	900,429	Pittsburgh, PA	669,817
Columbus, OH	290,564	Portland, ME	70,810
Dallas, TX	260,475	Portland, OR	301,815
Denver, CO	287,861	Providence, RI	252,981
Detroit, MI	1,568,662	Richmond, VA	182,929
Fall River, MA	115,274	Rochester, NY	328,132
Houston, TX	292,352	Salt Lake City, UT	140,267
Indianapolis, IN	364,161	San Francisco, CA	634,394
Jacksonville, FL	129,549	Savannah, GA	85,024
Kansas City, MO	399,746	Scranton, PA	143,433
Little Rock, AR	81,679	Seattle, WA	365,583
LosAngeles, CA	1,238,048	Springfield, IL	149,900
Louisville, KY	307,745	St.Louis, MO	821,960
Manchester, NH	253,143	St.Paul, MN	271,606
Memphis, TN	110,637	Washington, DC	486,869
Milwaukee, WI	578,249		

Table 20: Effect of Distance on Price Dispersion in Canada: Specification 2

Product	log distance	dist squared	R-squared
Sirloin steak	5.176e-02**	-3.714e-03**	0.52
Round steak	3.277e-02**	-2.014e-03*	0.44
Rib roast	0.01209	-3.43E-04	0.47
Shoulder roast	2.750e-02*	-0.0011	0.51
Stewing beef	1.423e-01**	-1.050e-02**	0.41
Veal shoulder	2.125e-01**	-1.468e-02**	0.38
Mutton leg roast	-5.528e-02**	6.606e-03**	0.60
Leg	5.964e-02**	-4.059e-03**	0.55
Salt mess pork	1.508e-02*	-7.33E-04	0.44
Bacon not sliced	-1.108e-01**	1.215e-02**	0.76
Bacon sliced	-1.299e-01**	1.410e-02**	0.75
Ham sliced	0.003137	0.000175	0.57
Salt cod	-1.788e-01**	1.950e-02**	0.66
Finnan haddie	-7.809e-02**	8.442e-03**	0.61
Canned salmon	1.511e-01**	-9.890e-03**	0.42
Lard	2.616e-02**	-1.379e-03*	0.47
Eggs fresh	3.196e-02**	-1.641e-03*	0.29
Eggs cooking	-0.00053	1.383e-03*	0.44
Milk	4.624e-02**	-3.109e-03**	0.56
Butter solids	1.279e-02+	-2.79E-04	0.49
Butter creamery	3.729e-02**	-2.222e-03**	0.49
Cheese	-5.154e-02**	5.729e-03**	0.59
Soda biscuits	-1.866e-02*	3.008e-03**	0.72
Flour	1.776e-01**	-1.189e-02**	0.48
Rolled oats	1.776e-02**	-5.96E-04	0.56
Rice	9.928e-02**	-6.713e-03**	0.47
Tapioca	-1.119e-01**	1.265e-02**	0.76
Tomatoes canned	-2.335e-02**	4.598e-03**	0.57
Peas canned	-3.028e-02**	4.791e-03**	0.57
Corn canned	-6.869e-02**	8.600e-03**	0.63
Beans dry	-3.399e-02**	4.281e-03**	0.68
Onions	5.006e-02**	-1.806e-03*	0.54
Potatoes 100lb	-3.551e-02**	7.823e-03**	0.74
Potatoes 15lb	-1.918e-02+	5.796e-03**	0.70
Prunes	-1.059e-02*	1.342e-03**	0.60
Raisins	1.709e-02**	-7.817e-04*	0.44
Currants	4.592e-02**	-3.160e-03**	0.51
Jam	-0.00324	1.099e-03*	0.51
Peaches canned	0.009871	2.38E-04	0.53
Marmalade	1.038e-02*	-9.27E-05	0.51
Corn syrup	-0.00296	3.209e-03**	0.57
Sugar granulated	9.685e-03+	1.66E-04	0.41
Sugar yellow	0.004339	6.43E-04	0.45
Coffee	-6.205e-02**	6.600e-03**	0.51
Tea	0.001534	1.099e-03*	0.50
Pooled with Product dummies	6.232e-03**	1.185e-03**	0.46

Table 21: Effect of Distance on Price Dispersion in Canada: Specification 3

Product	log distance	Ports	Without Ports	R-squared
Sirloin steak	7.820e-03**	-5.905e-02**	3.324e-02**	0.54
Round steak	8.910e-03**	-4.670e-02**	2.599e-02**	0.46
Rib roast	7.679e-03**	-4.747e-02**	-4.43E-03	0.48
Shoulder roast	1.452e-02**	-1.549e-02**	5.319e-03+	0.52
Stewing beef	1.833e-02**	-1.58E-02	7.66E-05	0.39
Veal shoulder	3.945e-02**	3.099e-02*	-1.984e-02*	0.36
Mutton leg roast	2.265e-02**	-2.199e-02**	2.282e-02**	0.59
Leg	1.180e-02**	-3.072e-02**	2.845e-02**	0.55
Salt mess pork	6.405e-03**	5.74E-03	-8.065e-03**	0.44
Bacon not sliced	3.249e-02**	3.83E-03	3.00E-03	0.69
Bacon sliced	3.638e-02**	4.54E-03	3.27E-03	0.67
Ham sliced	5.216e-03**	4.207e-03+	-2.06E-03	0.57
Salt cod	5.092e-02**	-2.657e-02**	1.24E-03	0.58
Finnan haddie	2.128e-02**	-1.533e-02**	-1.036e-02**	0.58
Canned salmon	3.444e-02**	-9.23E-03	-3.49E-03	0.41
Lard	9.868e-03**	-4.21E-03	-4.41E-04	0.47
Eggs fresh	1.253e-02**	2.09E-03	-1.085e-02**	0.29
Eggs cooking	1.574e-02**	2.83E-03	-6.673e-03*	0.44
Milk	9.519e-03**	-7.24E-03	-1.46E-03	0.56
Butter solids	9.530e-03**	-1.74E-03	5.253e-03*	0.49
Butter creamery	1.111e-02**	-1.98E-03	4.711e-03*	0.48
Cheese	1.600e-02**	1.089e-02*	-1.110e-02**	0.56
Soda biscuits	1.685e-02**	1.99E-03	3.26E-03	0.71
Flour	3.731e-02**	-6.84E-03	7.09E-03	0.44
Rolled oats	1.074e-02**	-2.01E-03	3.01E-03	0.56
Rice	1.997e-02**	-4.749e-02**	2.161e-02**	0.47
Tapioca	3.737e-02**	1.26E-02	-7.53E-03	0.74
Tomatoes canned	3.093e-02**	7.60E-03	-1.08E-05	0.56
Peas canned	2.619e-02**	3.95E-03	-5.656e-03+	0.55
Corn canned	3.275e-02**	8.760e-03+	-4.55E-03	0.59
Beans dry	1.652e-02**	-1.193e-02**	1.378e-02**	0.67
Onions	2.880e-02**	-9.010e-03*	1.136e-02**	0.54
Potatoes 100lb	5.670e-02**	-8.08E-03	1.59E-03	0.73
Potatoes 15lb	4.914e-02**	-1.20E-02	6.572e-03+	0.69
Prunes	5.236e-03**	3.64E-03	-2.60E-03	0.60
Raisins	7.842e-03**	-4.22E-03	-5.64E-04	0.44
Currants	8.572e-03**	-1.121e-02**	-1.85E-03	0.50
Jam	9.771e-03**	1.763e-02**	-9.306e-03**	0.52
Peaches canned	1.264e-02**	2.03E-03	-7.089e-03**	0.54
Marmalade	9.295e-03**	-1.31E-03	2.28E-03	0.51
Corn syrup	3.494e-02**	8.663e-03*	4.48E-04	0.57
Sugar granulated	1.144e-02**	-3.23E-03	-2.227e-02**	0.44
Sugar yellow	1.166e-02**	-1.706e-02**	-1.793e-02**	0.48
Coffee	1.575e-02**	-5.03E-03	1.65E-03	0.47
Tea	1.446e-02**	-2.34E-03	-3.149e-03+	0.50
Pooled with Product dummies	2.017e-02**	-6.964e-03**	9.94E-04	0.46

Table 22: Border City Pairings

Benchmark City	City Pairs				
Halifax	Saint John	Boston	Fall River		
Saint John	Halifax	Quebec	Portland		
Quebec	Saint John	Montreal	Portland	Boston	Manchester
Montreal	Quebec	Ottawa	Manchester	Providence	New Haven
	New York	Bridgeport			
Ottawa	Montreal	Toronto	New York	Newark	Scranton
Toronto	Ottawa	Hamilton	Rochester	Philadelphia	Indianapolis
	Chicago	Milwaukee			
Hamilton	Toronto	London	Buffalo	Pittsburgh	
London	Hamilton	Windsor	Cleveland	Columbus	
Windsor	London	Winnipeg	Detroit	Cincinnati	Columbus
Winnigeg	Windsor	Regina	Milwaukee	Minneapolis	Louisville
Regina	Winnigeg	Saskatoon	Minneapolis	St Paul	
Saskatoon	Regina	Edmonton	Butte		
Edmonton	Saskatoon	Calgary	Butte		
Calgary	Edmonton	Vancouver	Seattle		
Vancouver	Calgary	Victoria	Seattle	Portland	
Victoria	Vancouver	Portland			
Boston	Halifax	Quebec	Manchester	Fall River	
Bridgeport	Montreal	New Haven	New York		
Buffalo	Hamilton	Pittsburgh	Rochester		
Butte	Saskatoon	Edmonton	Minneapolis	Portland	
Chicago	Toronto	Indianapolis	Milwaukee		
Cincinnati	Windsor	Louisville	Detroit		
Cleveland	London	Columbus	Pittsburgh		
Columbus	London	Windsor	Cleveland	Detroit	
Detroit	Windsor	Columbus	Cincinnati		
Fall River	Halifax	Boston	Providence		
Indianapolis	Toronto	Louisville	Chicago		
Louisville	Winnigeg	Indianapolis	Cincinnati		
Manchester	Quebec	Montreal	Portland	Boston	
Milwaukee	Winnigeg	Chicago	St Paul		
Minneapolis	Regina	Winnipeg	Butte	St Paul	
Newark	Ottawa	New York	Philadelphia		
New Haven	Montreal	Providence	Bridgeport		
New York	Montreal	Ottawa	Bridgeport	Newark	
Philadelphia	Toronto	Newark	Scranton		
Pittsburgh	Hamilton	Cleveland	Buffalo		
Portland ME	St John	Quebec	Manchester		
Portland OR	Vancouver	Victoria	Seattle		
Providence	Montreal	Fall River	New Haven		
Rochester	Toronto	Scranton	Buffalo		
Scranton	Ottawa	Philadelphia	Rochester		
Seattle	Calgary	Vancouver	Portland		
St. Paul	Regina	Minneapolis	Milwaukee		

Table 23: Monthly $\tilde{q}_{i,j}$ for Border City Pairs

	Canadian Cities		U.S. Cities	
Item	Mean	St. Dev.	Mean	St. Dev.
Sirloin Steak	0.101833	0.086395	0.102765	0.059695
Round Steak	0.089146	0.059095	0.076096	0.048509
Rib Roast	0.117189	0.072909	0.101801	0.074516
Shoulder Roast	0.103776	0.05304	0.088913	0.047824
Stewing Beef	0.120643	0.087947	0.133758	0.118508
Mutton Leg	0.109502	0.049592	0.07319	0.043904
Bacon, sliced	0.067016	0.032508	0.083071	0.044235
Ham, sliced	0.054854	0.028014	0.091689	0.06541
Salmon, canned	0.135344	0.074198	0.059031	0.028825
Lard	0.048974	0.016306	0.061824	0.046456
Eggs, fresh	0.073035	0.026814	0.092023	0.067203
Milk	0.111663	0.069753	0.083561	0.068153
Butter	0.040387	0.023746	0.028686	0.013031
Cheese	0.050329	0.017987	0.049285	0.027767
Flour	0.055299	0.035005	0.057754	0.03029
Rolled Oats	0.082595	0.022449	0.081659	0.066778
Rice	0.081653	0.040376	0.07044	0.037496
Peas, canned	0.059466	0.027472	0.080541	0.050901
Corn, canned	0.062707	0.038263	0.078738	0.047511
Onions	0.134046	0.037989	0.097571	0.035409
Potatoes	0.182271	0.095805	0.128271	0.064305
Prunes	0.08853	0.027013	0.07821	0.063864
Sugar	0.044465	0.024617	0.049186	0.03886
Coffee	0.056229	0.024945	0.063718	0.04023
Tea	0.04006	0.016545	0.088012	0.065652
All Goods	0.084441	0.059664	0.079992	0.059306

Table 24: MAPD for Canadian Cities (Annual): All Pairs

Product	All Years	1922-1924	1925-1927	1928-1930	1931-1933	1934-1936
Sirloin Steak	0.134	0.152	0.134	0.115	0.141	0.130
Round Steak	0.124	0.155	0.120	0.102	0.123	0.121
Rib Roast	0.140	0.173	0.145	0.116	0.134	0.135
Shoulder Roast	0.141	0.184	0.135	0.121	0.142	0.128
Stewing Beef	0.185	0.208	0.157	0.159	0.208	0.197
Mutton Leg	0.147	0.174	0.173	0.140	0.124	0.129
Bacon, sliced	0.117	0.144	0.120	0.129	0.115	0.081
Ham, sliced	0.056	0.072	0.050	0.051	0.062	0.047
Salmon, canned	0.205	0.180	0.163	0.161	0.255	0.264
Lard	0.079	0.071	0.065	0.090	0.098	0.070
Eggs, fresh	0.114	0.122	0.099	0.101	0.132	0.117
Milk	0.158	0.186	0.160	0.134	0.166	0.149
Butter	0.064	0.069	0.059	0.058	0.073	0.061
Cheese	0.084	0.066	0.057	0.068	0.116	0.110
Flour	0.121	0.104	0.099	0.106	0.162	0.130
Rolled Oats	0.091	0.102	0.106	0.086	0.088	0.074
Rice	0.132	0.108	0.115	0.111	0.156	0.171
Peas, canned	0.101	0.108	0.096	0.108	0.114	0.080
Corn, canned	0.108	0.116	0.102	0.103	0.118	0.102
Onions	0.138	0.157	0.126	0.119	0.143	0.147
Potatoes	0.216	0.208	0.225	0.237	0.200	0.209
Prunes	0.074	0.077	0.081	0.071	0.081	0.064
Sugar	0.071	0.060	0.065	0.081	0.072	0.075
Coffee	0.095	0.075	0.076	0.087	0.125	0.110
Tea	0.073	0.058	0.042	0.058	0.109	0.095
All Goods	0.119	0.125	0.111	0.108	0.130	0.120
Avg. Pairwise Distance	987					
Observations	2346					

Table 25: MAPD for U.S. Cities (Annual): All Pairs

Product	All Years	1922-1924	1925-1927	1928-1930	1931-1933	1934-1936
Sirloin Steak	0.209	0.233	0.229	0.203	0.198	0.181
Round Steak	0.164	0.199	0.183	0.150	0.147	0.138
Rib Roast	0.139	0.165	0.156	0.117	0.129	0.128
Shoulder Roast	0.131	0.145	0.139	0.112	0.123	0.137
Stewing Beef	0.147	0.166	0.144	0.118	0.158	0.150
Mutton Leg	0.079	0.095	0.075	0.077	0.087	0.061
Bacon, sliced	0.107	0.118	0.090	0.105	0.135	0.087
Ham, sliced	0.105	0.125	0.091	0.094	0.113	0.099
Salmon, canned	0.073	0.115	0.058	0.060	0.066	0.069
Lard	0.083	0.082	0.076	0.086	0.108	0.063
Eggs, fresh	0.176	0.190	0.164	0.162	0.213	0.152
Milk	0.164	0.174	0.173	0.164	0.176	0.131
Butter	0.050	0.054	0.050	0.051	0.057	0.038
Cheese	0.086	0.057	0.059	0.084	0.132	0.096
Flour	0.116	0.114	0.104	0.130	0.133	0.097
Rolled Oats	0.088	0.103	0.084	0.088	0.097	0.071
Rice	0.120	0.097	0.092	0.123	0.151	0.139
Peas, canned	0.101	0.106	0.118	0.109	0.098	0.071
Corn, canned	0.088	0.098	0.089	0.087	0.091	0.077
Onions	0.141	0.158	0.128	0.140	0.157	0.121
Potatoes	0.204	0.262	0.178	0.202	0.221	0.156
Prunes	0.102	0.094	0.104	0.097	0.104	0.109
Sugar	0.065	0.060	0.071	0.073	0.067	0.056
Coffee	0.097	0.095	0.082	0.092	0.119	0.098
Tea	0.165	0.162	0.175	0.184	0.158	0.143
All Goods	0.120	0.131	0.116	0.116	0.129	0.107
Avg. Pairwise Distance	929					
Observations	1275					

Table 26: MAPD for International City Pairs (Annual): All Pairs

Product	All Years	1922-1924	1925-1927	1928-1930	1931-1933	1934-1936
Sirloin Steak	0.357	0.315	0.321	0.303	0.389	0.451
Round Steak	0.420	0.367	0.379	0.339	0.461	0.547
Rib Roast	0.326	0.308	0.306	0.232	0.351	0.430
Shoulder Roast	0.357	0.318	0.333	0.267	0.380	0.484
Stewing Beef	0.239	0.218	0.197	0.173	0.247	0.357
Mutton Leg	0.277	0.310	0.305	0.254	0.239	0.276
Bacon, sliced	0.150	0.143	0.128	0.123	0.169	0.189
Ham, sliced	0.150	0.230	0.121	0.133	0.119	0.151
Salmon, canned	0.177	0.181	0.130	0.151	0.211	0.211
Lard	0.170	0.199	0.110	0.194	0.202	0.143
Eggs, fresh	0.161	0.175	0.146	0.150	0.179	0.155
Milk	0.213	0.228	0.216	0.196	0.236	0.189
Butter	0.198	0.212	0.191	0.171	0.179	0.242
Cheese	0.181	0.168	0.163	0.138	0.208	0.227
Flour	0.206	0.134	0.124	0.121	0.266	0.380
Rolled Oats	0.414	0.477	0.415	0.354	0.475	0.357
Rice	0.142	0.118	0.107	0.124	0.195	0.164
Peas, canned	0.177	0.109	0.107	0.114	0.237	0.315
Corn, canned	0.108	0.125	0.100	0.097	0.115	0.105
Onions	0.158	0.170	0.140	0.137	0.184	0.160
Potatoes	0.587	0.490	0.598	0.478	0.734	0.625
Prunes	0.112	0.106	0.115	0.101	0.105	0.133
Sugar	0.135	0.131	0.141	0.111	0.131	0.158
Coffee	0.280	0.331	0.192	0.246	0.278	0.353
Tea	0.262	0.159	0.138	0.179	0.480	0.346
All Goods	0.238	0.229	0.209	0.195	0.271	0.286
Avg. Pairwise Distance	1114					
Observations	3519					

Table 27: Canada-U.S. Border Effect (All Cities with Pop. > 50,000): 1922-1936

Item	Period	Log Distance	Border	Border Effect ('000s of miles)	Obs.	R^2
Sirloin Steak	1922-1925	6.622e-02**	1.303e-01**	6.7	9765	0.66
	1925-1928	6.533e-02**	1.241e-01**	6.2		
	1928-1931	6.076e-02**	1.276e-01**	7.9		
	1931-1934	5.979e-02**	2.084e-01**	35		
	1934-1936	5.769e-02**	2.880e-01**	160		
Round Steak	1922-1925	5.767e-02**	2.486e-01**	81	9765	0.77
	1925-1928	5.480e-02**	2.532e-01**	110		
	1928-1931	4.941e-02**	2.213e-01**	95		
	1931-1934	4.870e-02**	3.319e-01**	998		
	1934-1936	4.761e-02**	4.355e-01**	10,289		
Rib Roast	1922-1925	3.275e-02**	1.373e-01**	71	9765	0.64
	1925-1928	3.138e-02**	1.156e-01**	43		
	1928-1931	2.497e-02**	8.709e-02**	35		
	1931-1934	2.646e-02**	1.939e-01**	1,667		
	1934-1936	2.662e-02**	2.632e-01**	21,567		
Shoulder Roast	1922-1925	2.917e-02**	2.479e-01**	5,377	9765	0.76
	1925-1928	2.777e-02**	2.448e-01**	7,382		
	1928-1931	2.352e-02**	1.791e-01**	2,222		
	1931-1934	2.531e-02**	2.694e-01**	45,966		
	1934-1936	2.732e-02**	3.580e-01**	538,002		
Stewing Beef	1922-1925	1.616e-02**	6.826e-02**	74	9765	0.54
	1925-1928	1.238e-02**	6.606e-02**	227		
	1928-1931	8.182e-03**	4.935e-02**	455		
	1931-1934	1.474e-02**	6.386e-02**	82		
	1934-1936	1.367e-02**	1.841e-01**	773,834		
Mutton Leg	1922-1925	8.609e-03**	1.737e-01**	6.3.E+08	9765	0.67
	1925-1928	6.040e-03**	1.824e-01**	1.4.E+13		
	1928-1931	6.133e-03**	1.522e-01**	6.6.E+10		
	1931-1934	7.862e-03**	1.308e-01**	1.8.E+07		
	1934-1936	4.453e-03**	2.002e-01**	3.7.E+19		
Bacon, sliced	1922-1925	3.277e-02**	9.526e-03*	0.4	9765	0.30
	1925-1928	2.821e-02**	1.635e-02**	0.9		
	1928-1931	3.071e-02**	-0.00277	0		
	1931-1934	3.407e-02**	2.124e-02**	0.9		
	1934-1936	2.699e-02**	9.758e-02**	40		
Ham, sliced	1922-1925	2.003e-02**	1.317e-01**	785	9765	0.39
	1925-1928	1.532e-02**	5.418e-02**	37		
	1928-1931	1.599e-02**	6.081e-02**	48		
	1931-1934	1.882e-02**	2.088e-02**	2.2		
	1934-1936	1.656e-02**	7.733e-02**	116		
Salmon, canned	1922-1925	1.314e-02**	3.991e-02**	21.8	9765	0.59
	1925-1928	4.673e-03**	7.232e-03*	4.1		
	1928-1931	5.430e-03**	6.049e-02**	75,479.5		
	1931-1934	6.656e-03**	4.721e-02**	1,317.8		
	1934-1936	7.189e-03**	6.804e-02**	14,129.9		
Lard	1922-1925	1.353e-02**	1.276e-01**	13,663	9765	0.45
	1925-1928	1.274e-02**	3.634e-02**	18		
	1928-1931	1.419e-02**	8.441e-02**	419		
	1931-1934	1.729e-02**	6.668e-02**	51		
	1934-1936	1.079e-02**	8.787e-02**	3,771		
Eggs, fresh	1922-1925	7.220e-02**	-7.494e-03+	0	9765	0.53
	1925-1928	6.839e-02**	1.300e-02**	0.2		
	1928-1931	6.860e-02**	2.206e-02**	0.4		
	1931-1934	7.609e-02**	-9.178e-03*	-0.1		
	1934-1936	6.715e-02**	2.096e-02**	0.4		
Milk	1922-1925	3.424e-02**	4.559e-02**	3.1	9765	0.4

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Table 27 – continued from previous page

Product	Period	Log Distance	Border	Border Effect ('000s of miles)	Obs.	R^2
	1925-1928	3.403e-02**	4.150e-02**	2.6		
	1928-1931	3.275e-02**	2.413e-02**	1.2		
	1931-1934	3.403e-02**	5.115e-02**	3.8		
	1934-1936	2.751e-02**	3.763e-02**	3.2		
Butter	1922-1925	8.130e-03**	1.626e-01**	5.3.E+08	9765	0.84
	1925-1928	7.619e-03**	1.477e-01**	2.9.E+08		
	1928-1931	7.430e-03**	1.310e-01**	5.0.E+07		
	1931-1934	8.562e-03**	1.341e-01**	6.9.E+06		
	1934-1936	5.919e-03**	2.224e-01**	2.3.E+16		
Cheese	1922-1925	9.264e-03**	1.096e-01**	150,603	9765	0.46
	1925-1928	9.753e-03**	9.047e-02**	11,704		
	1928-1931	1.333e-02**	4.357e-02**	27.7		
	1931-1934	2.050e-02**	4.517e-02**	8.8		
	1934-1936	1.525e-02**	1.025e-01**	908		
Flour	1922-1925	2.543e-02**	2.165e-02**	1.5	9765	0.6
	1925-1928	2.397e-02**	1.274e-02**	0.8		
	1928-1931	2.774e-02**	-2.053e-02**	-0.6		
	1931-1934	2.872e-02**	1.268e-01**	90		
	1934-1936	2.296e-02**	2.857e-01**	277,907		
Rolled Oats	1922-1925	7.618e-03**	4.190e-01**	8.4.E+23	9765	0.88
	1925-1928	5.039e-03**	3.665e-01**	4.2.E+31		
	1928-1931	6.157e-03**	2.843e-01**	1.2.E+20		
	1931-1934	7.343e-03**	3.963e-01**	3.0.E+23		
	1934-1936	3.523e-03**	3.054e-01**	4.9.E+37		
Rice	1922-1925	4.885e-03**	1.233e-02**	12.6	9765	0.46
	1925-1928	4.153e-03**	1.127e-02**	15.4		
	1928-1931	8.356e-03**	0.00356	0.6		
	1931-1934	1.252e-02**	5.063e-02**	61		
	1934-1936	1.144e-02**	0.003359	0.4		
Peas, canned	1922-1925	9.588e-03**	-0.00403	-0.4	9765	0.57
	1925-1928	1.094e-02**	-1.400e-02**	-0.8		
	1928-1931	9.658e-03**	-0.00198	-0.2		
	1931-1934	8.368e-03**	1.318e-01**	7.6.E+06		
	1934-1936	4.181e-03**	2.553e-01**	3.6.E+26		
Corn, canned	1922-1925	1.494e-02**	6.235e-03+	0.6	9765	0.26
	1925-1928	1.343e-02**	-0.00215	-0.2		
	1928-1931	1.313e-02**	-7.120e-03*	-0.5		
	1931-1934	1.382e-02**	5.342e-03+	0.5		
	1934-1936	1.148e-02**	2.164e-02**	6		
Onions	1922-1925	4.343e-02**	5.45E-03	0.1	9765	0.38
	1925-1928	3.845e-02**	6.446e-03+	0.2		
	1928-1931	4.100e-02**	-1.944e-02**	-0.4		
	1931-1934	4.341e-02**	2.273e-02**	0.8		
	1934-1936	3.791e-02**	3.662e-02**	1.8		
Potatoes	1922-1925	5.556e-02**	2.441e-01**	88	9765	0.74
	1925-1928	4.422e-02**	4.257e-01**	16,622		
	1928-1931	4.744e-02**	2.773e-01**	378		
	1931-1934	4.873e-02**	5.519e-01**	90,883		
	1934-1936	4.087e-02**	4.962e-01**	205,376		
Prunes	1922-1925	1.465e-02**	2.567e-02**	5.2	9765	0.43
	1925-1928	1.650e-02**	3.259e-02**	6.8		
	1928-1931	1.546e-02**	2.347e-02**	3.9		
	1931-1934	1.655e-02**	0.000752	0.1		
	1934-1936	1.692e-02**	1.459e-02**	1.5		
Sugar	1922-1925	8.726e-03**	5.250e-02**	448	9765	0.52
	1925-1928	1.044e-02**	4.252e-02**	63		
	1928-1931	1.104e-02**	1.187e-02**	2.1		
	1931-1934	1.011e-02**	4.760e-02**	120		
	1934-1936	8.909e-03**	8.008e-02**	8,780		
Coffee	1922-1925	1.37E-03	2.421e-01**	-	9765	0.55

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Table 27 – continued from previous page

Product	Period	Log Distance	Border	Border Effect ('000s of miles)	Obs.	R^2
	1925-1928	5.71E-05	1.032e-01**	-		
	1928-1931	1.54E-03	1.471e-01**	-		
	1931-1934	5.597e-03**	1.583e-01**	2.1.E+12		
	1934-1936	2.814e-03**	2.428e-01**	3.3.E+37		
Tea	1922-1925	3.138e-02**	-2.26E-03	-0.1	9765	0.39
	1925-1928	3.334e-02**	-3.901e-02**	-0.8		
	1928-1931	3.510e-02**	-0.00302	-0.1		
	1931-1934	3.243e-02**	3.065e-01**	13,943		
	1934-1936	3.001e-02**	1.944e-01**	712		
All Goods	1922-1925	2.575e-02**	1.078e-01**	71	244,125	0.37
	1925-1928	2.365e-02**	9.547e-02**	61		
	1928-1931	2.361e-02**	7.935e-02**	30		
	1931-1934	2.555e-02**	1.369e-01**	232		
	1934-1936	2.232e-02**	1.771e-01**	3,059		

Table 28: Canada-U.S. Border Effect (Border Cities): 1922-1936

Item	Period	Log Distance	Border	Border Effect ('000s of miles)	Obs.	R^2
Sirloin Steak	1922-1925	5.116e-02**	2.344e-01**	32	390	0.81
	1925-1928	5.028e-02**	2.368e-01**	37		
	1928-1931	4.731e-02**	2.178e-01**	33		
	1931-1934	4.818e-02**	2.669e-01**	85		
	1934-1936	4.747e-02**	3.054e-01**	208		
Round Steak	1922-1925	5.845e-02**	3.145e-01**	72	390	0.89
	1925-1928	5.345e-02**	3.271e-01**	152		
	1928-1931	5.069e-02**	2.721e-01**	71		
	1931-1934	5.214e-02**	3.656e-01**	371		
	1934-1936	5.189e-02**	4.389e-01**	1,579		
Rib Roast	1922-1925	9.98E-03	1.892e-01**	-	390	0.81
	1925-1928	9.05E-03	1.758e-01**	-		
	1928-1931	4.43E-03	1.317e-01**	-		
	1931-1934	7.64E-03	2.173e-01**	-		
	1934-1936	3.12E-03	2.985e-01**	-		
Shoulder Roast	1922-1925	4.282e-02**	2.574e-01**	136	390	0.90
	1925-1928	3.805e-02**	2.922e-01**	724		
	1928-1931	3.497e-02**	2.206e-01**	184		
	1931-1934	3.879e-02**	3.035e-01**	837		
	1934-1936	3.741e-02**	4.092e-01**	18,856		
Stewing Beef	1922-1925	2.554e-02**	7.013e-02**	4.9	390	0.73
	1925-1928	1.947e-02*	9.652e-02**	47.3		
	1928-1931	1.712e-02*	7.898e-02**	33		
	1931-1934	2.648e-02**	9.249e-02**	11		
	1934-1936	2.034e-02*	2.408e-01**	46,403		
Mutton Leg	1922-1925	2.308e-02**	1.761e-01**	6.9.E+02	390	0.72
	1925-1928	2.212e-02**	1.723e-01**	8.1.E+02		
	1928-1931	2.120e-02**	1.399e-01**	2.5.E+02		
	1931-1934	2.282e-02**	1.071e-01**	3.6.E+01		
	1934-1936	1.894e-02**	1.788e-01**	4.2.E+03		
Bacon, sliced	1922-1925	1.069e-02*	0.00085	0.0	390	0.53
	1925-1928	0.006765	3.556e-02**	-		
	1928-1931	0.007335	0.007945	-		
	1931-1934	9.576e-03+	9.605e-02**	7,605		
	1934-1936	0.004599	1.349e-01**	-		
Ham, sliced	1922-1925	9.329e-03+	1.352e-01**	6.6.E+05	390	0.52
	1925-1928	4.1.E-03	4.637e-02**	-		
	1928-1931	2.8.E-03	6.198e-02**	-		
	1931-1934	4.2.E-03	3.086e-02*	-		
	1934-1936	0.000665	9.614e-02**	-		
Salmon, canned	1922-1925	-1.307e-02*	1.187e-01**	-	390	0.61
	1925-1928	-1.816e-02**	5.821e-02**	-		
	1928-1931	-1.915e-02**	1.178e-01**	-		
	1931-1934	-1.702e-02**	1.090e-01**	-		
	1934-1936	-1.443e-02*	1.148e-01**	-		
Lard	1922-1925	1.659e-02**	1.219e-01**	520	390	0.73
	1925-1928	1.562e-02**	2.095e-02*	1		
	1928-1931	1.688e-02**	7.419e-02**	27		
	1931-1934	1.641e-02**	9.600e-02**	116		
	1934-1936	1.432e-02**	7.411e-02**	59		
Eggs, fresh	1922-1925	2.074e-02**	7.652e-02**	13	390	0.60
	1925-1928	1.912e-02**	4.249e-02**	2.8		
	1928-1931	1.883e-02**	2.246e-02+	0.8		
	1931-1934	2.179e-02**	2.851e-02**	0.9		
	1934-1936	1.642e-02**	5.174e-02**	7.5		
Milk	1922-1925	4.202e-02**	0.009185	0.0	390	0.6
	1925-1928	4.208e-02**	-0.0008	0.0		
	1928-1931	3.730e-02**	0.00278	0.0		

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Table 28 – continued from previous page

Product	Period	Log Distance	Border	Border Effect ('000s of miles)	Obs.	R^2
	1931-1934	4.143e-02**	0.02339	0.0		
	1934-1936	3.455e-02**	9.45E-03	0.0		
Butter	1922-1925	9.627e-03**	1.711e-01**	1.8.E+07	390	0.92
	1925-1928	8.507e-03**	1.570e-01**	3.5.E+07		
	1928-1931	7.814e-03**	1.447e-01**	3.7.E+07		
	1931-1934	1.098e-02**	1.390e-01**	1.1.E+05		
	1934-1936	7.972e-03**	2.235e-01**	5.0.E+11		
Cheese	1922-1925	9.258e-03*	1.219e-01**	175,144	390	0.72
	1925-1928	9.272e-03*	1.038e-01**	24,376		
	1928-1931	9.900e-03*	8.613e-02**	2,011		
	1931-1934	1.547e-02**	1.189e-01**	729		
	1934-1936	1.286e-02*	1.610e-01**	91,657		
Flour	1922-1925	3.69E-03	2.215e-02+	-	390	0.83
	1925-1928	2.33E-04	4.049e-02**	-		
	1928-1931	1.19E-03	2.276e-02+	-		
	1931-1934	2.32E-03	1.580e-01**	-		
	1934-1936	2.52E-03	3.022e-01**	-		
Rolled Oats	1922-1925	1.31E-03	3.510e-01**	-	390	0.90
	1925-1928	-2.4.E-03	3.292e-01**	-		
	1928-1931	-4.4.E-03	2.825e-01**	-		
	1931-1934	-3.3.E-03	3.684e-01**	-		
	1934-1936	-0.00799	3.014e-01**	-		
Rice	1922-1925	9.494e-03*	2.202e-02+	3.1	390	0.41
	1925-1928	9.619e-03*	1.81E-02	0.0		
	1928-1931	1.109e-02*	0.007261	0.0		
	1931-1934	1.686e-02**	6.115e-02**	12		
	1934-1936	1.236e-02**	2.953e-02+	3.3		
Peas, canned	1922-1925	9.928e-03+	2.841e-02*	5.5	390	0.75
	1925-1928	1.252e-02*	2.11E-02	0.0		
	1928-1931	1.153e-02*	3.830e-02**	8.9		
	1931-1934	1.028e-02+	1.794e-01**	1.3.E+07		
	1934-1936	5.83E-03	2.922e-01**	2.0.E+21		
Corn, canned	1922-1925	2.065e-02**	1.893e-02+	-	390	0.48
	1925-1928	2.095e-02**	0.007539	0.0		
	1928-1931	1.842e-02**	0.01851			
	1931-1934	1.888e-02**	3.256e-02**	1.5		
	1934-1936	1.762e-02**	5.624e-02**	8		
Onions	1922-1925	1.718e-02**	-1.43E-03	0.0	390	0.37
	1925-1928	1.242e-02**	0.002955	0.0		
	1928-1931	1.473e-02**	-0.01197	0.0		
	1931-1934	1.535e-02**	4.336e-02**	5.3		
	1934-1936	1.297e-02**	3.303e-02*	3.9		
Potatoes	1922-1925	5.163e-02**	2.132e-01**	20	390	0.85
	1925-1928	4.673e-02**	3.556e-01**	676		
	1928-1931	4.846e-02**	2.651e-01**	79		
	1931-1934	5.317e-02**	4.711e-01**	2,360		
	1934-1936	5.177e-02**	4.132e-01**	980		
Prunes	1922-1925	2.27E-03	2.593e-02*	-	390	0.52
	1925-1928	0.002677	2.636e-02+	-		
	1928-1931	0.000991	2.359e-02+	-		
	1931-1934	7.89E-04	2.441e-02*	-		
	1934-1936	9.34E-04	3.848e-02**	-		
Sugar	1922-1925	1.841e-02**	4.394e-02**	3.3	390	0.66
	1925-1928	1.856e-02**	4.830e-02**	4.2		
	1928-1931	2.152e-02**	-0.00201	0.0		
	1931-1934	2.121e-02**	3.737e-02**	1.6		
	1934-1936	1.912e-02**	6.571e-02**	10.1		
Coffee	1922-1925	-3.90E-03	2.535e-01**	-	390	0.66
	1925-1928	-6.03E-03	1.306e-01**	-		
	1928-1931	-5.57E-03	1.782e-01**	-		

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Table 28 – continued from previous page

Product	Period	Log Distance	Border	Border Effect ('000s of miles)	Obs.	R^2
	1931-1934	-3.89E-03	2.184e-01**	-		
	1934-1936	-2.85E-03	2.874e-01**	-		
Tea	1922-1925	1.229e-02*	4.654e-02**	14.4	390	0.56
	1925-1928	1.172e-02*	0.02317	0.0		
	1928-1931	1.325e-02**	4.625e-02**	10.7		
	1931-1934	1.470e-02**	2.941e-01**	1.6.E+08		
	1934-1936	1.464e-02**	1.739e-01**	48,281		
All Goods	1922-1925	1.896e-02**	1.210e-01**	198	9,750	0.50
	1925-1928	1.686e-02**	1.109e-01**	240		
	1928-1931	1.614e-02**	9.807e-02**	146		
	1931-1934	1.840e-02**	1.555e-01**	1,568		
	1934-1936	1.591e-02**	1.894e-01**	49,555		

Table 29: U.S. EAV Tariff Rates

	1923	1924	1925	1926	1927	1928	1929	1930 (Jan-July)	1930 (July-Dec)
Beef, fresh	25.8	32.6	29.0	28.5	24.3	27.1	28.5	32.4	58.4
Mutton	29.8	27.2	19.9	29.2	32.5	28.1	29.2	32.5	64.3
Pork, fresh	3.9	4.5	3.9	3.4	3.8	3.9	3.4	3.2	9.0
Ham or bacon	5.5	7.0	5.8	15.4	10.0	9.2	15.4	4.8	8.7
Canned meats	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Lard	6.5	5.8	5.0	6.1	6.1	4.9	6.0	5.0	17.3
Eggs	28.0	25.5	27.8	23.0	26.7	27.6	27.2	26.3	51.4
Milk	12.9	15.8	15.0	14.8	14.7	14.1	14.8	20.9	36.2
Butter	22.3	22.2	22.2	33.6	35.3	33.7	32.1	36.5	43.3
Cheese	29.3	29.0	28.6	29.3	16.3	16,5	17.1	31.5	57.6
Flour	29.3	30.8	31.6	26.1	24.0	32.7	29.7	19.9	27.2
Rolled oats	9.0	8.1	6.7	10.5	2.1	1.2	2.1	8.5	8.5
Rice	48.1	45.3	44.0	42.3	43.0	50.3	49.4	50.9	72.9
Peas, canned	19.1	16.3	18.5	18.5	15.7	17.1	25.8	18.0	18.5
Other canned veg.	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Potatoes	20.6	18.2	22.7	20.6	30.1	35.4	29.8	24.6	58.3
Onions	48.9	49.6	49.6	52.9	45.3	47.1	85.9	78.4	161.6
Prunes	10.2	4.7	5.5	4.3	4.9	7.5	5.0	6.8	5.8
Coffee	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	1931	1932	1933	1934	1935	1936
Beef, fresh	71.0	73.8	80.4	71.8	66.4	77.6
Mutton	86.0	74.2	119.5	50.6	53.2	5.0
Pork, fresh	12.6	24.5	13.9	17.4	18.1	18.1
Ham or bacon	10.7	16.0	20.0	10.8	13.7	12.0
Canned meats	20.0	20.0	20.0	20.0	64.8	28.9
Lard	52.4	11.8	26.3	23.8	38.5	28.9
Eggs	55.4	70.2	73.5	53.8	55.6	63.5
Milk	39.8	42.2	40.0	22.4	28.1	30.6
Butter	53.6	66.8	89.1	83.7	88.7	68.6
Cheese	42.4	39.6	41.7	88.7	71.3	35.5
Flour	29.6	38.5	54.6	37.9	50.0	55.5
Rolled oats	5.0	2.1	2.2	9.7	16.7	9.6
Rice	85.2	118.6	90.0	86.2	91.2	96.8
Peas, canned	20.7	37.2	22.5	21.0	10.2	17.3
Other canned veg.	35.0	35.0	35.0	35.0	35.0	35.0
Potatoes	65.7	83.3	52.3	52.8	75.3	28.0
Onions	148.1	146.9	187.3	147.0	113.4	119.3
Prunes	7.3	10.9	10.8	3.8	13.0	14.2
Coffee	0.0	0.0	0.0	0.0	0.0	0.0
Tea	0.0	0.0	0.0	0.0	0.0	0.0